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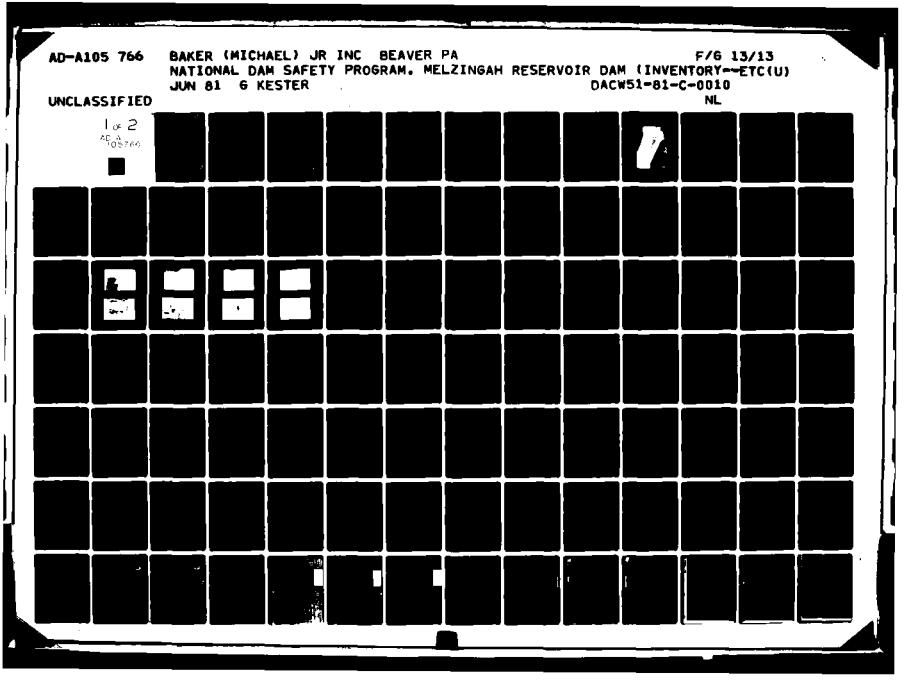
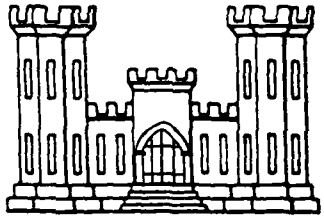


LOWER HUDSON RIVER BASIN

MELZINGAH RESERVOIR DAM

DUTCHESS COUNTY, NEW YORK
INVENTORY NO. N.Y. 032

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



NEW YORK DISTRICT CORPS OF ENGINEERS

JUNE 1981

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Malzingah Dam
Dutchess County
Lower Hudson River Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Examination of available documents and a visual inspection of the dam and appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Using the Corps of Engineers' screening criteria, it has been determined that the dam would be overtopped for all storms exceeding approximately 14 percent of the Probable Maximum Flood (PMF). The spillway is, therefore, adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a "seriously inadequate spillway" is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that, based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity, so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream.

On the basis of stability analyses of the concrete gravity portion of the dam performed for this investigation, the factors of safety against overturning are generally low, and the locations of the resultants fall outside of the middle 1/3. The stability of the dam against sliding was determined to be inadequate for all loading conditions.

It is therefore recommended that, within three months of notification of the owner, detailed hydrologic and hydraulic investigations of the structure should be undertaken to more accurately determine the site-specific characteristics of the watershed and their effects upon the overtopping potential of the dam. At the same time, further analyses of the structural stability of the dam should be performed. The seepage areas should be investigated to determine their cause and needed repairs. The results of these investigations and analyses will determine the appropriate remedial measures required to restore the stability and safety of the structure. In the interim, a detailed emergency action plan must be developed and implemented during periods of unusually heavy precipitation. Around-the-clock surveillance must also be provided during these periods.

Current inspection and maintenance procedures by the owner are adequate but need to be documented. Monitoring of the reservoir levels should be expanded to include readings during peak flow periods.

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
MELZINGAH RESERVOIR DAM
I.D. No. NY 032
DEC DAM No. 213A-523A LOWER HUDSON RIVER BASIN
DUTCHESS COUNTY, NEW YORK

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Melzingah Reservoir Dam (I.D. No. NY 032)
State:	New York
County:	Dutchess
Stream:	Gordons Brook
Dates of Inspection:	11 January 1981 8 March 1981

ASSESSMENT

Examination of available documents and a visual inspection of the dam and appurtenant structures did not reveal conditions which constitute an immediate hazard to human life or property.

Using the Corps of Engineers' screening criteria, it has been determined that the dam would be overtopped for all storms exceeding approximately 14 percent of the Probable Maximum Flood (PMF). The spillway is, therefore, adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a "seriously inadequate spillway" is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that, based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity, so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream.

On the basis of stability analyses of the concrete gravity portion of the dam performed for this investigation, the factors of safety against overturning are generally low, and the locations of the resultants fall outside of the middle 1/3. The stability of the dam against sliding was determined to be inadequate for all loading conditions.

It is therefore recommended that, within three months of notification of the owner, detailed hydrologic and hydraulic investigations of the structure should be undertaken to more

accurately determine the site-specific characteristics of the watershed and their effects upon the overtopping potential of the dam. At the same time, further analyses of the structural stability of the dam should be performed. The seepage areas should be investigated to determine their cause and needed repairs. The results of these investigations and analyses will determine the appropriate remedial measures required to restore the stability and safety of the structure. In the interim, a detailed emergency action plan must be developed and implemented during periods of unusually heavy precipitation. Around-the-clock surveillance must also be provided during these periods.

Current inspection and maintenance procedures by the owner are adequate but need to be documented. Monitoring of the reservoir levels should be expanded to include readings during peak flow periods.

The following remedial measures must be completed within one year:

1. The trees and brush must be removed from the downstream toe of the dam. All trees with a trunk diameter greater than 3 inches must have their root systems removed. All resultant areas of erosion and cavities should be filled, graded, compacted, and seeded.

2. All trees in the spillway discharge channel must be cut off at ground level.

3. The gunite surface of the dam must be repaired.

4. The leak in the 12-inch water supply line must be repaired.

5. The deteriorated construction joint in the upstream face must be repaired.

SUBMITTED: _____
Granville Kester, Jr., P.E.
Vice President
MICHAEL BAKER, JR. of New York, INC.

APPROVED: _____
Colonel W.M. Smith, Jr.
New York District Engineer

DATE: 30 JUN 1981

Overall View of Dam
Melzingah Reservoir Dam
I.D. No. NY 032
11 January 1981

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
MELZINGAH RESERVOIR DAM
I.D. No. NY 032
DEC DAM No. 213A-523A
LOWER HUDSON RIVER BASIN
DUTCHESS COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority - The Phase I Inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection - This inspection was conducted to evaluate the existing conditions of the dam, to identify deficiencies and hazardous conditions, to determine if these deficiencies constitute hazards to life and property, and to recommend remedial measures where required.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam - Melzingah Reservoir Dam is a gunite-coated, concrete gravity structure 49.2 feet high (measured from the crest to the toe of the dam) and 524 feet long with a vertical upstream face, a downstream face sloping at 1V:0.7H (Vertical to Horizontal), and a crest width of 5 feet. The 100-foot wide concrete spillway begins 25 feet from the right abutment.[1] The spillway has a 45° inclined upstream face, a 2-foot wide crest, and a sloping downstream face. Spillway training walls 18 inches wide are on the downstream face of the dam extending from the crest to the discharge channel.

The discharge channel at the toe of the dam contains many large boulders. Fifty feet downstream from the base of the dam, there is a 3-foot drop to a steep and narrow channel leading to an abandoned dam 600 feet downstream.

[1]Looking downstream.

Gate houses on the upstream and downstream sides of the dam immediately to the left of the spillway contain the valves to control the two 24-inch diameter cast-iron pipes which lead out of the impoundment. One of the pipes serves as a blow-off, and the other is a water supply line reduced to a 12-inch pipe. Both 24-inch pipes extend just downstream of the lower gate house.

b. Location - Melzingah Reservoir Dam on Gordons Brook, a tributary of the Hudson River, is 2 miles south of Beacon, New York. The reservoir and dam are in Dutchess County, New York. The coordinates of the dam are N 41° 28.3' and W 73° 58.1'. The dam can be found on the West Point, New York, USGS 7.5 minute topographic quadrangle. A Location Map is shown in Appendix F.

c. Size Classification - Melzingah Reservoir Dam is 49.2 feet high, and the reservoir storage capacity at the crest of the dam (elevation 423.4 feet M.S.L.) is 187 acre-feet. Therefore, the dam is in the "intermediate" size category as defined by the Recommended Guidelines for Safety Inspection of Dams (Reference 14, Appendix D).

d. Hazard Classification - One house, a garage, and Route 9D are located 2500 feet downstream from the dam. Loss of life in the home is likely if the dam were to fail. Melzingah Reservoir Dam is therefore considered to be in the "high" hazard category as defined by the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership - The dam and reservoir are owned and operated by the City of Beacon, 427 Main, Beacon, New York 12508. The contact person is Mr. Mark Giordano (Telephone 914-831-0932).

f. Purpose of the Dam - Melzingah Reservoir is one of three reservoirs used as a water supply for the City of Beacon, New York.

g. Design and Construction - The dam was designed by George W. Krieger, Jr., and constructed by an unknown contractor in 1924. Gunite was applied to the entire surface of the dam in 1961.

h. Normal Operating Procedures - The reservoir level is typically maintained at the spillway crest. The dam is visited daily when used for water supply and weekly otherwise. The owner's representative reported that the dam and leaks in the

spillway are visually inspected during each visit. The valves are operated once a year.

1.3 PERTINENT DATA

a. Drainage Area (square miles) - 1.42

b. Discharge at Dam (c.f.s.)

Spillway Capacity (at Minimum Top of Dam Elev. 423.4 ft. M.S.L.)	447.0
Reservoir Drain at Normal Pool	92.0

c. Elevation (Feet Above M.S.L.)[2] -

Minimum Top of Dam	423.4
Normal Pool (Spillway Crest)	422.0
Streambed at Toe of Dam	374.2

d. Reservoir Surface (Acres) -

Top of Dam (Elev. 423.4 ft. M.S.L.)	6.83
Spillway Crest (Elev. 422.0 ft. M.S.L.)	6.43

e. Reservoir Storage Capacity (Acre-Feet) -

Top of Dam (Elev. 423.4 ft. M.S.L.)	187.0
Spillway Crest (Elev. 422.0 ft. M.S.L.)	178.0

f. Dam -

Type: Concrete	
Length (Feet)	524.0
Height (Feet)	49.2
Top Width (Feet)	5.0
Side Slopes - Upstream	Vertical
Downstream	1V:0.7H
Cut-off - 3-foot x 5-foot concrete excavated into rock and hardpan	

g. Spillway -

Type: Concrete broad-crested weir	
Crest Length Perpendicular to Flow (Feet)	100.0
Crest Width Parallel to Flow (Feet)	2.0
Crest Elevation (Feet M.S.L.)	422.0

[2]All elevations are referenced to the spillway crest, elev. 422.0 ft. M.S.L., estimated from the USGS 7.5 minute topographic quadrangle, West Point, NY.

h. Reservoir Drain -

Type: Two 24-inch cast-iron pipes extend to just downstream of the lower gate house. One is reduced to a 12-inch pipe for water supply; the other is used as a blow-off to the discharge channel.

Control: Manual control valves in the gate houses.

SECTION 2: ENGINEERING DATA

2.1 GEOLOGY

The Melzingah Reservoir Dam is located in the "New England Uplands" physiographic province of New York State. This province is geologically complex and composed of characteristically diverse metamorphic and igneous rock. Bedrock occurring in the immediate vicinity of the dam, as indicated on the Geologic Map of New York (J. G. Broughton and others, 1970), consists of Middle Proterozoic Era (greater than 600 million years old), gray hornblende granite and granitic gneiss. Granitic gneiss was noted as outcropping below the right abutment of the dam during the visual inspection. This dam lies approximately 1 mile east of a major thrust fault and approximately 2 miles west of a normal fault. This entire area has been glaciated by the major ice sheet advances which occurred during the Pleistocene Epoch. The most recent ice advance ended approximately 11,000 years ago.

2.2 SUBSURFACE INVESTIGATION

Subsurface information is available in the application for permission to construct the dam, submitted to the State of New York in April 1923, and construction inspection reports dated 13 July 1923 and 17 July 1924. The available information, however, is contradictory. The application describes the foundation of the dam as being entirely bedrock, specifically schist. The 13 July 1923 construction inspection report describes the foundation as being granite on the right side of the dam extending to 80 feet left of the spillway, with the remainder of the foundation consisting of hard, impervious red clay with some gravel and stones. The second construction inspection report is similar to the earlier one, however, bedrock is described as extending approximately 400 feet left of the spillway, with the remaining 150 feet consisting of hardpan (blue clay and gravel).

2.3 DAM AND APPURTENANT STRUCTURES

The subject dam is a replacement water supply structure for a dam that failed in 1897, situated 80 feet downstream. The present dam is a gunite-coated, concrete gravity structure with a vertical upstream face, sloped downstream face (sloping 1V:0.7H), and minimum flat crest width of 5 feet. A 100-foot wide concrete weir comprises the spillway which has also been sealed with

gunite. The spillway begins 25 feet left of the right abutment, and its crest is 1.4 feet lower than the minimum crest of the dam. The configuration of the structure at the spillway is generally similar to the rest of the dam.

As discussed in Section 2.2, the right end of the dam is founded on bedrock; the left end is founded on hardpan. In addition, a key 3 feet wide and 5 feet deep was excavated along the upstream toe of the structure and subsequently backfilled with concrete, according to available background drawings. Earth backfill was placed along the downstream side of the dam to the left of the spillway.

Gate houses on the upstream and downstream sides of the dam immediately left of the spillway contain the controls for two 24-inch diameter cast-iron pipes draining the impoundment. One of the pipes serves as a blow-off, while the other is a water supply line reduced to a 12-inch pipe. Both 24-inch pipes extend to just downstream of the lower gate house.

2.4 CONSTRUCTION RECORDS

The available design and construction records consist of general design plans and the accompanying permit application filed in April 1923 with the State of New York, and two brief construction inspection reports dated 13 July 1923 and 17 July 1924. This information is included in Appendices F and G.

2.5 OPERATION RECORDS

Formal operation records are not kept by the City of Beacon. However, the water plant operator visits the dam on a daily or weekly basis, depending on whether the reservoir is being used. During his visits, the operator visually inspects the dam and the leaks in the vicinity of the spillway. All control valves for the 24-inch outlets are operated at least annually.

2.6 EVALUATION OF DATA

The background information collected during this investigation was obtained primarily from files of the New York State Department of Environmental Conservation. Supplementary information was acquired through conversations with Mr. Mark Giordano, representing the City of Beacon Water and Sewer Authority. The available data are considered adequate and reliable for Phase I Inspection purposes.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - The inspection was performed on 11 January 1981. The weather was sunny and windy with the temperature 10°-20°F., with 2-4 inches of snow on the crest of the dam and 4-6 inches of snow on the ground. The water surface was 11.6 feet below the spillway crest. Deficiencies found during the inspection will require remedial treatment. A Field Sketch of conditions found during the inspection is included in Appendix F. The complete Visual Inspection Checklist is presented as Appendix B. Because there was a snow cover on the dam during the initial inspection, a follow-up inspection was carried out on 11 March 1981.

b. Spillway - The spillway is located 25 feet from the right abutment and is generally in fair condition. The spillway is a concrete broad-crested weir with a freeboard of 1.4 feet. On the downstream face of the dam, 18-inch wide spillway training walls lead from the crest to the base of the dam.

The surface of the spillway was gunited in 1961. The spillway has cracks and two large seeps at the base of the dam.

Water was flowing (3-5 gpm) from the area beneath the spillway. The origin of the flow was undetectable due to the presence of large boulders in the immediate area.

c. Dam - The dam is a concrete structure 524 feet long with a height of 49.2 feet and a crest width of 5 feet. The entire surface was gunited in 1961; the gunite surface is deteriorating and is cracked over the entire upstream and downstream faces of the dam. A minor amount of spalling was noted. Near the toe of the dam between the spillway and left abutment, five minor seeps were found, all 3 to 7 feet above the toe of the dam.

An irregularity or "bump" in the gunite surface was also observed on the downstream face of the dam, approximately 200 feet from the left abutment. The "bump" appeared to be the result of seepage through the gunite surface which carried and deposited material at this location. The size of

the bump is approximately 6 inches wide by 3 inches high.

Trees and brush are growing along the toe of the dam.

d. 8 March 1981 Inspection - At the time of inspection, the dam was free of snow and ice; the reservoir had filled; and there was approximately 1 inch of flow over the spillway crest. The general deterioration of the gunite surface on the dam was noted to be particularly bad along the toe of the center section of the dam on the downstream face. In this area, the gunite was severely spalled (see Photo 8). On the upstream crest of the dam approximately 75 feet from the left abutment, a construction joint has also deteriorated and created a void approximately 4 inches deep; 2 feet long; and 2 feet wide.

e. Outlet Works - Two 24-inch outlet pipes extend to just downstream of the lower gatehouse. A 12-inch water supply line for the City of Beacon is joined to one 24-inch pipe; the other 24-inch pipe is used as a blow-off pipe to drain the reservoir. There was ice under the joint for the water supply line. All valves are operated at least once a year. The upper concrete block gatehouse is situated on the crest of the dam near the left side of the spillway and is in good condition.

f. Downstream Channel - The downstream channel below the spillway has large boulders at the base on the right side of the spillway. There are small trees growing in the discharge channel.

The discharge channel flows into Lower Melzingah Reservoir, which is now empty because of its deteriorated condition. Lower Melzingah Reservoir Dam discharges into a steep, narrow bouldered, and tree-lined channel.

One house, a garage, and a highway (9D) are located 2500 feet downstream from the dam. The stream flows through a 6-foot x 6-foot concrete box culvert under the highway.

g. Reservoir - The slopes of the reservoir are moderate with woods and good cover. There were no signs of instability, and sedimentation was not reported to be a problem.

3.2 EVALUATION

Visual inspection revealed several deficiencies in this structure. The following items were noted:

1. There are two large seeps at the base of the spillway;
2. Water was flowing (3-5 gpm) from beneath the spillway;
3. Five minor seeps were found 3 to 7 feet above the toe of the dam between the spillway and left abutment;
4. Trees and brush are growing along the toe of the dam;
5. There are small trees growing in the discharge channel;
6. The gunite surface of the dam is deteriorating and is cracked over the entire upstream and downstream faces;
7. An irregularity or "bump" in the gunite surface was observed on the downstream face of the dam, approximately 200 feet from the left abutment;
8. The junction of the 24-inch pipe and the 12-inch water supply line is leaking; and
9. A construction joint has deteriorated on the upstream crest of the dam approximately 75 feet from the left abutment, creating a void approximately 4 inches deep, 2 feet long, and 2 feet wide.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

There are no formal operating procedures. The operation of the dam is normally an automatic function controlled by the crest of the spillway at elevation 422.0 feet T.B.M., but because of the water shortage in the area, the water surface was 11.6 feet below the spillway crest at the time of inspection. The reservoir is used for water supply through the 12-inch pipe. Water can be released to the downstream area by the 24-inch blow-off pipe which has a valve on the upstream side of the dam.

4.2 MAINTENANCE OF THE DAM

Maintenance of the dam is the responsibility of the City of Beacon. The water plant operator visits the dam every day when the reservoir is in use, and weekly when it is not. He visually inspects the dam and the leaks in the spillway. The valves are operated once a year. Maintenance on the dam is performed as needed.

4.3 WARNING SYSTEM

At the time of the inspection, there was no warning system or emergency action plan in operation.

4.4 EVALUATION

Past maintenance of the dam and operating facilities appears to have been adequate, but the past activities have gone undocumented (except for the water level measurements). A checklist should be compiled by the owner's representative to document the findings made during the periodic inspections and the maintenance items completed. A warning system and emergency action plan should be developed and put into operation.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE AREA CHARACTERISTICS

Delineation of the watershed of Melzingah Reservoir Dam was made using the USGS quadrangle for West Point, New York. The drainage basin has moderate slopes covered by forests and ground vegetation with occasional rock outcroppings. No storage exists upstream of the reservoir. There has been no development within the 1.42 sq. mi. drainage area.

5.2 ANALYSIS CRITERIA

A hydrologic analysis of the watershed and hydraulic analysis of the dam was conducted using the U.S. Army Corps of Engineers' Flood Hydrograph Package HEC-1 DB computer program (Reference 12, Appendix E). The unit hydrograph was defined using the Snyder's Unit Hydrograph Method. Estimates of Snyder's hydrograph coefficients were developed from average coefficients from the Hydrologic Flood Routing Model for Lower Hudson River Basin (Reference 16, Appendix E). Precipitation data was taken from Hydrometeorological Report No. 33 (Reference 8, Appendix E). Rainfall losses were estimated at an initial loss of 1.0 inch and a constant loss rate of 0.1 inch per hour thereafter. The hydraulic capacity of the dam, reservoir, and spillway was determined by incorporating the Modified Puls Routing Method. All flood routings began with the reservoir at normal pool level. Outlet discharge capacity was computed manually. The Probable Maximum Flood (PMF) and 1/2 Probable Maximum Flood (1/2 PMF) were developed and routed through the reservoir.

5.3 SPILLWAY CAPACITY

The spillway capacity at the top of dam is 447 cubic feet per second (c.f.s.). There is no auxiliary or emergency spillway at Melzingah Reservoir Dam.

5.4 RESERVOIR CAPACITY

The storage capacity of Melzingah Reservoir at normal pool is 178 acre-feet. The storage capacity of the reservoir at the minimum top of dam is 187 acre-feet. Therefore, flood control storage of the reservoir between the spillway crest and top of dam is 9 acre-feet. This volume represents a total of 1.18 inches of runoff from the watershed.

5.5 FLOODS OF RECORD

Information concerning the effects of significant floods on the dam is unavailable.

5.6 OVERTOPPING POTENTIAL

The maximum capacity of the spillway is 447 c.f.s. before overtopping would occur. The peak outflows of the PMF and 1/2 PMF are 3113 c.f.s. and 1556 c.f.s., respectively. Therefore, the spillways are capable of passing 14 percent of the PMF before overtopping would occur.

5.7 RESERVOIR EMPTYING POTENTIAL

The reservoir can be drawn down by means of the 24-inch blow-off pipe extending just downstream of the lower gate house. Neglecting inflow, the reservoir can be drawn down from normal pool in approximately 54 hours. This is equivalent to an approximate drawdown rate of 0.69 feet per hour, based on the hydraulic height measured from normal pool divided by the time to dewater the reservoir.

5.8 EVALUATION

Melzingah Reservoir Dam is a "small" size - "high" hazard dam requiring the spillway to pass a flood in the range of the 1/2 PMF to PMF. The PMF and 1/2 PMF were routed through the watershed and dam. It was determined that the spillway is capable of passing 14 percent of the PMF before overtopping the dam. Therefore the spillway is judged to be "seriously inadequate".

Conclusions pertain to present conditions; the effect of future development on the hydrology has not been considered.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF EMBANKMENT STABILITY

a. Visual Observations - No signs of instability were noted during the visual inspection. However, the concrete used in the construction of the dam appears to have been poor in quality, as indicated by cracking over the entire upstream and downstream faces of the dam; some spalling; several leaks; and the fact that it was necessary to apply gunite over the entire structure during 1961 to control the deterioration. Scaling of the concrete on the downstream face of the dam and minor leaks along vertical construction joints were observed as early as December 1928, approximately 4.5 years after completion of the dam (Appendix G).

b. Design and Construction Data - According to the available design plans, a 3-foot wide and 5-foot deep cut-off along the upstream toe of the dam was excavated into bedrock or hardpan and subsequently backfilled with concrete to control uplift and seepage. Construction inspection reports indicate that the foundation conditions were considered satisfactory. A stability analysis was not available for reference during this evaluation.

c. Operating Records - The dam is visually inspected at least once every week by a representative of the City of Beacon. The control valves for the 24-inch outlets which could be used to drain the reservoir, if necessary, are operated annually.

d. Post Construction Changes - Gunite was applied to the entire structure in 1961 to aid in the control of concrete deterioration and seepage. The gunite surface has since deteriorated significantly.

6.2 STABILITY ANALYSIS

The results of any previous stability analyses were unavailable for review during this evaluation. A structural stability analysis has been conducted for the maximum section of the dam located to the left of the spillway. The cases analyzed and respective results are as follows:

Case	Description of Loading Conditions
1	Normal operating conditions with the reservoir at the spillway crest (elev. 422.0 T.B.M.), full uplift (it is assumed that full uplift conditions have gradually developed beneath the cut-off in the period since construction in 1924), and no tailwater.
2	Same as Case 1 with the addition of ice loading of 5000 pounds per lineal foot.
3	Reservoir level during 1/2 PMF (elev. 424.3 T.B.M.), with full uplift, and a tailwater of 1.0 foot.
4	Reservoir level during the PMF (elev. 424.9 T.B.M.), with full uplift, and a tailwater of 1.5 feet.

Case	Factor of Safety		Location of Resultant from Toe (ft.)
	Overturning	Sliding	
1	1.36	1.67	13.7
2	1.27	1.59	11.2
3	1.26	1.52	11.0
4	1.23	1.49	10.3

Note: Location of middle 1/3 is 14.33 to 28.67 feet from the downstream toe.

A value of 2KSF was used as a conservative approximation of the shear strength of weathered rock.

Melzingah Reservoir Dam is situated in Seismic Zone 1. Seismic loading evaluations are not necessary for dams in this seismic zone.

In all cases, the factors of safety against overturning are generally low and the locations of the resultants fall outside of the middle 1/3. The factor of safety against sliding was less than 3 for all loading conditions. Therefore, the masonry-gravity portion of the dam is not considered safe against overturning and sliding. However, the structure has withstood normal loading conditions in the past without apparent damage, and the analyses may not indicate the true field conditions or proper loading conditions. Because overturning during the PMF would result in a probable loss of life downstream of the dam, a detailed stability analysis of the masonry-gravity portion of the dam should be performed by a qualified engineering firm within three months of owner notification.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety - Examination of available documents and visual inspections of Melzingah Reservoir Dam did not reveal any conditions which are considered to be hazardous.

Using the Corps of Engineers' screening criteria for review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 14 percent of the PMF. The overtopping of the dam could result in dam failure, increasing the hazard to loss of life downstream. Therefore, the spillway is adjudged as "seriously inadequate," and the dam if assessed as unsafe, non-emergency.

The "unsafe" classification applied to a dam because of a "seriously inadequate spillway" is not meant to connote the same degree of emergency as associated with an "unsafe" classification applied for a structural deficiency. However, it does mean that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream of the dam.

The stability analyses of the dam performed for this investigation indicate that the factors of safety against overturning and sliding are inadequate.

b. Adequacy of Information - The information available and the observations and measurements made during the visual inspection are considered sufficient for this Phase I Inspection Report.

c. Need for Additional Information - Detailed hydrologic and hydraulic investigations of the structure are considered necessary to more accurately determine the overtopping potential of the dam. A detailed stability analysis of the dam, including investigation of observed seepage, is considered necessary to determine actual stability conditions.

d. Urgency - The detailed hydrologic and hydraulic investigations and stability analyses must be initiated within three months of owner notification. Within one year, remedial measures resulting from these investigations must be initiated, with completion of these measures during the following year. In the interim, a detailed emergency action plan must be developed and implemented during periods of unusually heavy precipitation. Around-the-clock surveillance must also be provided during these periods.

7.2 RECOMMENDED MEASURES

Formal inspection and maintenance procedures should be developed with records maintained for future reference of inspection and maintenance completed.

The following remedial measures must be completed within one year:

1. The trees and brush should be removed from the downstream toe of the dam. All trees with a trunk diameter greater than 3 inches should have their root systems removed. All resultant areas of erosion and cavities should be filled, graded, compacted, and seeded.

2. All trees in the spillway discharge channel should be cut off at ground level.

3. The gunite surface of the dam should be repaired.

4. The leak in the 12-inch water supply line should be repaired.

APPENDIX A

PHOTOGRAPHS

CONTENTS

MELZINGAH RESERVOIR DAM

Photo 1. Spillway from Right Abutment
11 January 1981

Photo 2. Spillway from Downstream Side of Dam
11 January 1981

Photo 3. Downstream Face of Left Side of Dam
8 March 1981

Photo 4. Seep Below Spillway
11 January 1981

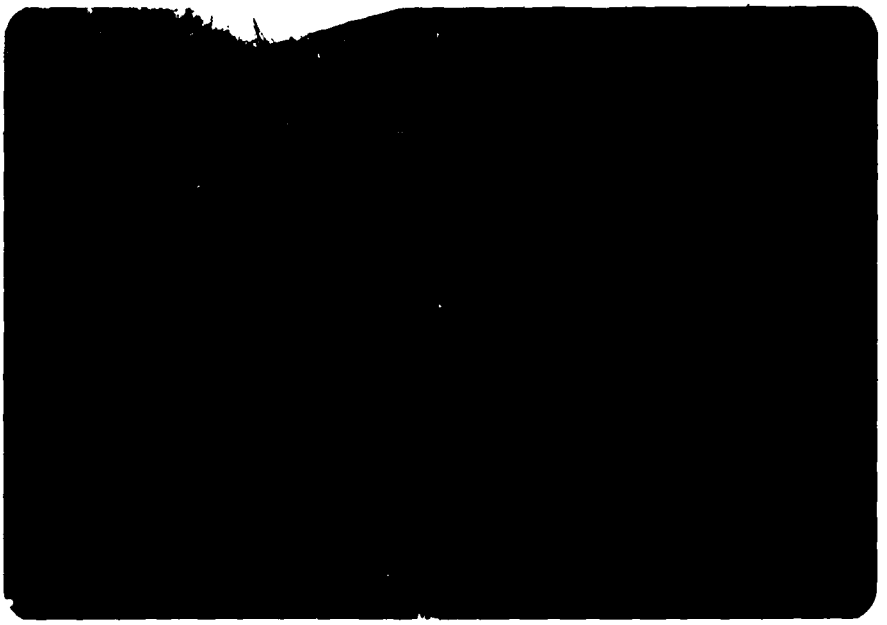


Photo 5. Downstream Face of Dam (Spillway)
8 March 1981

Photo 6. Bump on Downstream Face Near Left Abutment
11 January 1981

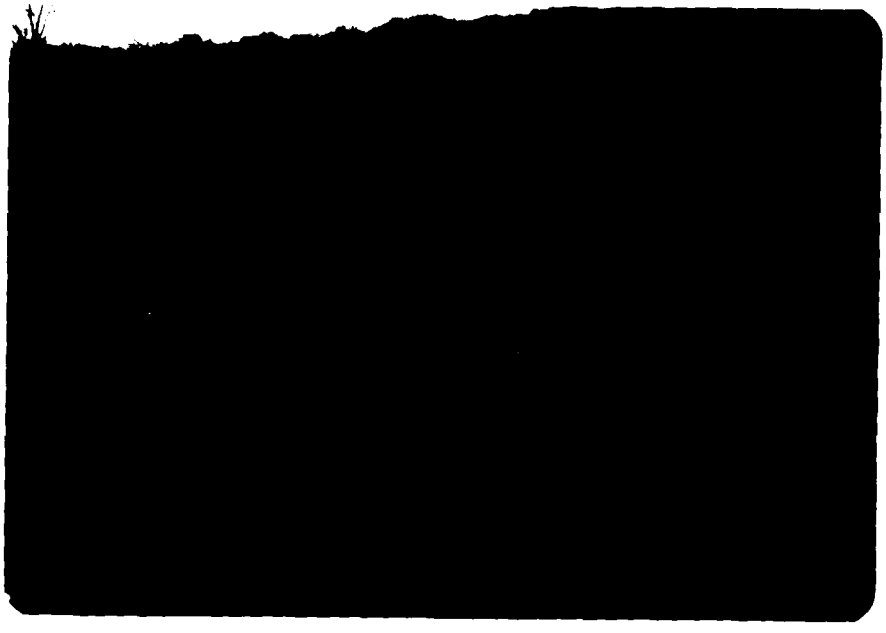


Photo 7. View Along Crest from Left Abutment
8 March 1981

Photo 8. Deteriorated Section of Gunite Coating
on Downstream Face of Dam
8 March 1981

APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Melzingah Reservoir Dam

Fed. I.D. # NY 032 DEC Dam No. 213A-523A

River Basin Lower Hudson

Location: Town Dutchess Junction County Dutchess

Stream Name Gordons Brook

Tributary of Hudson River

Latitude (N) 41°28.31' Longitude (W) 73°58.15'

Type of Dam Concrete

Hazard Category High

Date(s) of Inspection 11 January 1981

Weather Conditions Sunny, windy 15°F.

Reservoir Level at Time of Inspection 410.43 ft.

b. Inspection Personnel Wayne D. Lasch, Gary W. Todd, Rory L. Galloway

c. Persons Contacted (Including Address & Phone No.)

Mark Giordano, City Hall

427 Main

Beacon, NY 12508

914/831-0932

d. History:

Date Constructed 1924 Date(s) Reconstructed Gunited in 1961

Designer George W. Krieger, Jr.

Constructed By Not known

Owner City of Beacon, NY

2) Embankment - Not Applicable

a. Characteristics

(1) Embankment Material _____

_____

(2) Cutoff Type _____

_____

(3) Impervious Core _____

_____

(4) Internal Drainage System _____

_____

(5) Miscellaneous _____

_____

b. Crest

(1) Vertical Alignment _____

_____

(2) Horizontal Alignment _____

_____

(3) Surface Cracks _____

_____

(4) Miscellaneous _____

_____

c. Upstream Slope

(1) Slope (Estimate) (V:H) _____

_____

(2) Undesirable Growth or Debris, Animal Burrows _____

_____

(3) Sloughing, Subsidence, or Depressions _____

_____

_____

(4) Slope Protection _____

_____

_____

(5) Surface Cracks or Movement at Toe _____

_____

d. Downstream Slope

(1) Slope (Estimate - V:H) _____

_____

(2) Undesirable Growth or Debris, Animal Burrows _____

_____

_____

(3) Sloughing, Subsidence or Depressions _____

_____

_____

(4) Surface Cracks or Movement at Toe _____

_____

(5) Seepage _____

_____

_____

(6) External Drainage System (Ditches, Trenches, Blanket) _____

_____

_____

(7) Condition Around Outlet Structure _____

_____

(8) Seepage Beyond Toe _____

e. Abutments - Embankment Contact _____

(1) Erosion at Contact _____

(2) Seepage Along Contact _____

3) Drainage System

a. Description of System None

b. Condition of System Not Applicable

c. Discharge from Drainage System Not Applicable

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.) None

5) Reservoir

a. Slopes Reservoir slopes are moderate; slopes are primarily forested with scattered rock outcrops.

b. Sedimentation Sedimentation is not reported to be a problem.

c. Unusual Conditions Which Affect Dam None observed

6) Area Downstream of Dam

a. Downstream Hazard (No. of Homes, Highways, etc.) One home, 1 garage, and Rt. 9D are located 2,500 ft. downstream. Loss of life in the home is likely if the dam were to fail.

b. Seepage, Unusual Growth No unusual growth was observed; a large amount of seepage (5-15 g.p.m.) was observed issuing from a rock outcrop in the right valley wall 200 ft. downstream from the dam.

c. Evidence of Movement Beyond Toe of Dam None observed

d. Condition of Downstream Channel The channel is narrow and steep with boulders and large trees present. Lower Melzingah Dam, an abandoned earth embankment (25 ft. high x 400 ft. long), is 600 ft. downstream; this dam is likely to be overtopped and breached if Melzingah Dam fails.

7) Spillway(s) (Including Discharge Conveyance Channel)

a. General The spillway consists of a concrete, broad-crested weir with an inclined upstream face. The weir is 100 ft. long and 4 ft. wide. There are two 18 in. thick concrete training walls on the downstream face of the dam which extend from the crest of the spillway to toe of the dam.

b. Condition of Service Spillway There is extensive surface cracking of the gunite applied to the spillway and training walls. Two large seeps were observed on the downstream face of the spillway (total flow approx. 3-5 g.p.m.). Both seeps are located approximately 5-6 ft. above the base of the spillway.

c. Condition of Auxiliary Spillway None

d. Condition of Discharge Conveyance Channel Large boulders and rock outcrops form the right side of the spillway discharge channel. The left spillway training wall extends approximately 50 ft. downstream from the dam to form the left side of the spillway discharge channel. There are large boulders and several large trees in the channel. At the end of the training wall there is a 3 ft. drop into the streambed. No problems were observed in the discharge conveyance channel.

8) Reservoir Drain/Outlet

Type: Pipe X Conduit _____ Other _____

Material: Concrete _____ Metal Cast iron Other _____

Size: 24 in. Length Unknown

Invert Elevations: Entrance Unknown

Exit 375.8 ft.

Physical Condition (Describe): Unobservable

Material: Cast iron in good condition, no rust or scale.

Joints: Small leak at water supply line (ice formation). Alignment Good

Structural Integrity: No problems observed at time of inspection.

Hydraulic Capability: No problems observed.

Means of Control: Gate _____ Valve 24 in. Uncontrolled _____

Operation: Operable X Inoperable _____ Other _____

Present Condition (Describe): Appears operable, owner reports operating valves at least once a year.

9) Structural

a. Concrete Surfaces Had cracking in the gunite surface over entire upstream and downstream faces of the dam. Surface cracking along the crest of the dam in the gunite surfaces. Large bump (irregularity) located 100 ft. from right abutment near toe of dam.

b. Structural Cracking Not observed because of gunite surface.

c. Movement - Horizontal & Vertical Alignment (Settlement) None observed

d. Junctions with Abutments or Embankments No problems observed.

e. Drains - Foundation, Joint, Face None observed

f. Water Passages, Conduits, Sluices None observed

g. Seepage or Leakage At least 5 seeps from spillway to left abutment all located 3-7 ft. up from toe of dam. All seeps appeared as ice formations on the face of the dam; flow could not be determined.

h. Joints - Construction, etc. Unobservable because dam was gunited in 1961.

i. Foundation The foundation consists of bedrock (granite) or hard pan. A cutoff, 3 ft. wide and 5 ft. deep, was utilized along the upstream toe of the structure to control seepage and/or uplift.

j. Abutments No problems observed.

k. Control Gates None

l. Approach & Outlet Channels _____

m. Energy Dissipators (Plunge Pool, etc.) Large boulders in the discharge channel act as energy dissipators.

n. Intake Structures Unobservable

o. Stability No signs of instability were noted during the visual inspection.

p. Miscellaneous _____

10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition The main gatehouse is on the crest of dam near left side of spillway. The gatehouse is made of concrete block and appears to be in good condition.

APPENDIX C

HYDROLOGIC/HYDRAULIC DATA AND COMPUTATIONS

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject HELZINGAH RESERVOIR DAM S.O. No. _____
APPENDIX C Sheet No. ____ of ____
Drawing No. _____
Computed by _____ Checked by _____ Date _____

TABLE OF CONTENTS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

		Elevation * (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1)	Top of Dam	423.4	6.83	187
2)	Design High Water (Max. Design Pool)	Unknown	-	-
3)	Auxiliary Spillway Crest	-	-	-
4)	Pool Level with Flashboards	-	-	-
5)	Service Spillway Crest	422.0	6.43	178

DISCHARGES

		Volume (cfs)
1)	Average Daily	Unknown
2)	Spillway @ Maximum High Water - Top of Dam -	447
3)	Spillway @ Design High Water	Unknown
4)	Spillway @ Auxiliary Spillway Crest Elevation	N/A
5)	Low Level Outlet	92
6)	Total (of all facilities) @ Maximum High Water	539
7)	Maximum Known Flood	Unknown
8)	At Time of Inspection	0

*All elevations are referenced to the spillway crest, elevation 422.0 ft. M.S.L., estimated from the USGS topographic quadrangle for the area.

CREST: ELEVATION: 423.4

Type: Concrete

Width: 5 ft. Length: 524 ft.

Spillover Broad-crested weir.

Location Spillway is located 25 ft. left of right abutment.

SPILLWAY:

SERVICE		AUXILIARY
422.0	Elevation	None
Broad-crested weir	Type	-
100 ft.	Width	-
	Type of Control	
Uncontrolled	Uncontrolled	-
	Controlled:	
-	Type (Flashboards; gate)	-
-	Number	-
-	Size/Length	-
	Invert Material	-
	Anticipated Length of Operating Service	-
Approximately 45 ft.	Chute Length	-
40 ft.	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	-

HYDROMETEROLOGICAL GAGES:

Type: None

Location: _____

Records:

Date: _____

Max. Reading: _____

FLOOD WATER CONTROL SYSTEM:

Warning System: None

_____

Method of Controlled Releases (mechanisms):

Gate valve on blow-off pipe.

_____

_____

DRAINAGE AREA: 1.42 sq.mi.

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Forest

Terrain - Relief: Moderate slopes.

Surface - Soil: Well drained.

Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

No known plans to change the runoff patterns at the time of inspection.

Potential Sedimentation problem areas (natural or man-made; present or future)

No problem areas observed. All slopes are well vegetated.

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

None observed at time of inspection.

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

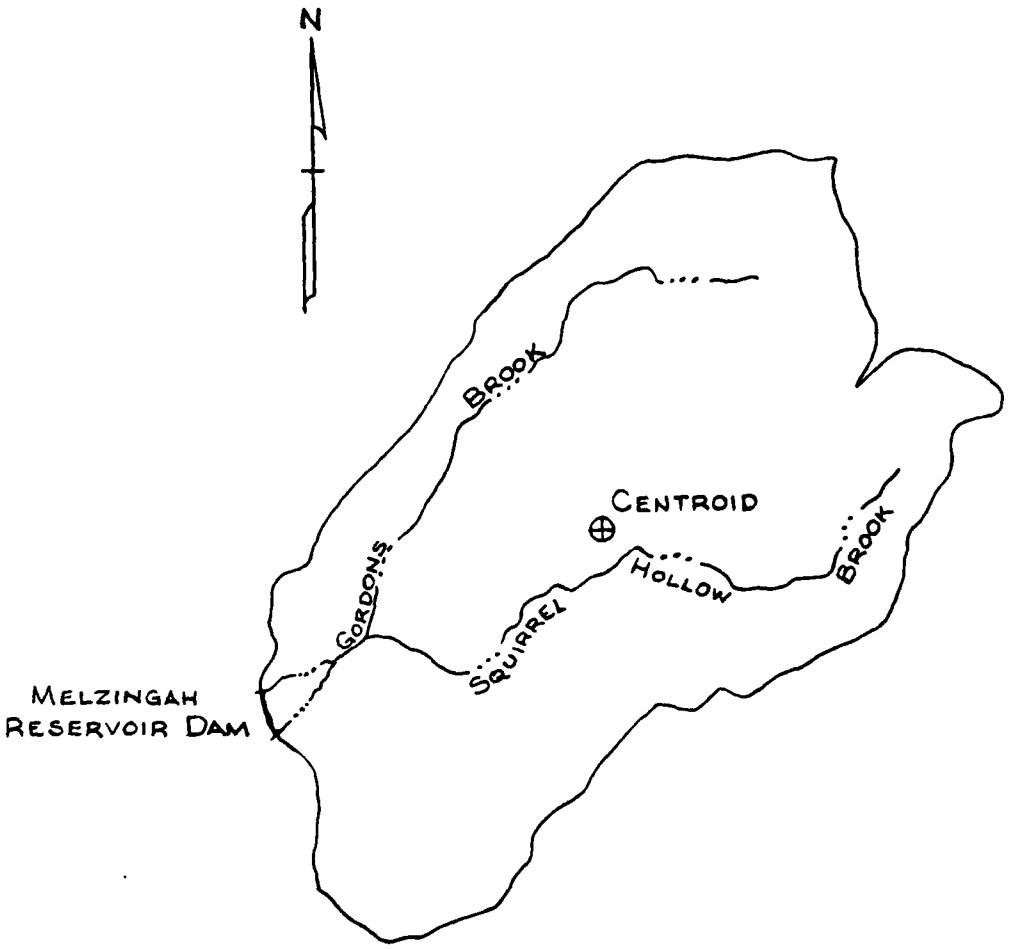
Location: None

Elevation:

Reservoir:

Length @ Maximum Pool 950 ft.

Length of Shoreline (@ Spillway Crest) 2,500 ft. (0.47 mi.)



QUAD : WEST POINT, N.Y.
DRAINAGE AREA = 1.42 SQ. MI.

DRAINAGE AREA ABOVE
MELZINGAH RESERVOIR DAM

SCALE : 1 IN. = 2000 FT.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR DAM S.O. No.
HYDRAULIC DATA Sheet No. 6 of 25
Drawing No.
Computed by GWT Checked by Date 1-16-81

STORAGE DATA

ELEVATION VS. SURFACE AREA

ELEVATION, (FT)	AREA, (ACRES) (MEASURED FROM USGS QUAD.)
422	6.43 (NORMAL POOL)
440	11.63
460	32.75

NORMAL POOL STORAGE IS 58 M.G. (178.01 Ac.-Ft.)
OBTAINED FROM THE RECORDS OF THE BEACON, N.Y. WATER DEPARTMENT.

$\Delta E = \frac{3S}{RAREA(2)}$ FROM HEC-1 FLOOD HYDROGRAPH PACKAGE, USERS MANUAL, 1973. APPENDIX B P. B-31

$= \frac{3(178.01)}{6.43}$

$\Delta E = 83.05$

$RELEV(1) = 422 - 83.05$

$= 339$ FT.

RELEV(2) = KNOWN STORAGE ELEVATION
RAREA(2) = AREA CORRESPONDING TO RELEV(2)
RELEV(1) = ELEVATION WHERE STORAGE IS ZERO
RELEV(1) = RELEV(2) - ΔE
RAREA(1) = 0
ΔE = CHANGE IN ELEVATION
S = KNOWN STORAGE AT RELEV(2) AND RAREA(2)

TOP OF DAM STORAGE

187 Ac.-Ft (FROM HEC-1 ANALYSIS)

DRAINAGE AREA - 1.42 Sq. Mi.

$L_{CA} = 4800$ FT. $= 0.91$ Mi. $L = 10,000$ FT. $= 1.93$ Mi.

$T_p = C_T (L \times L_{CA})^{.3}$

$T_p = 2.37$

RAINFALL DATA (FROM HMR-33)

DAM AND DRAINAGE AREA ARE LOCATED IN ZONE 1

PMP (24 HR.) 200 mi^2 = 21.3 IN.
PMP (6 HR) = 111% PMP (24 HR. 200 mi^2)
PMP (12 HR) = 123% PMP (24 HR. 200 mi^2)
PMP (24 HR) = 133% PMP (24 HR. 200 mi^2)
PMP (48 HR) = 142% PMP (24 HR. 200 mi^2)

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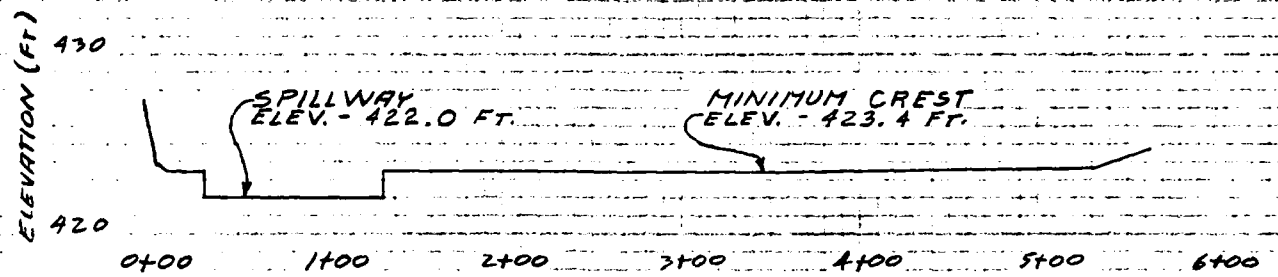
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

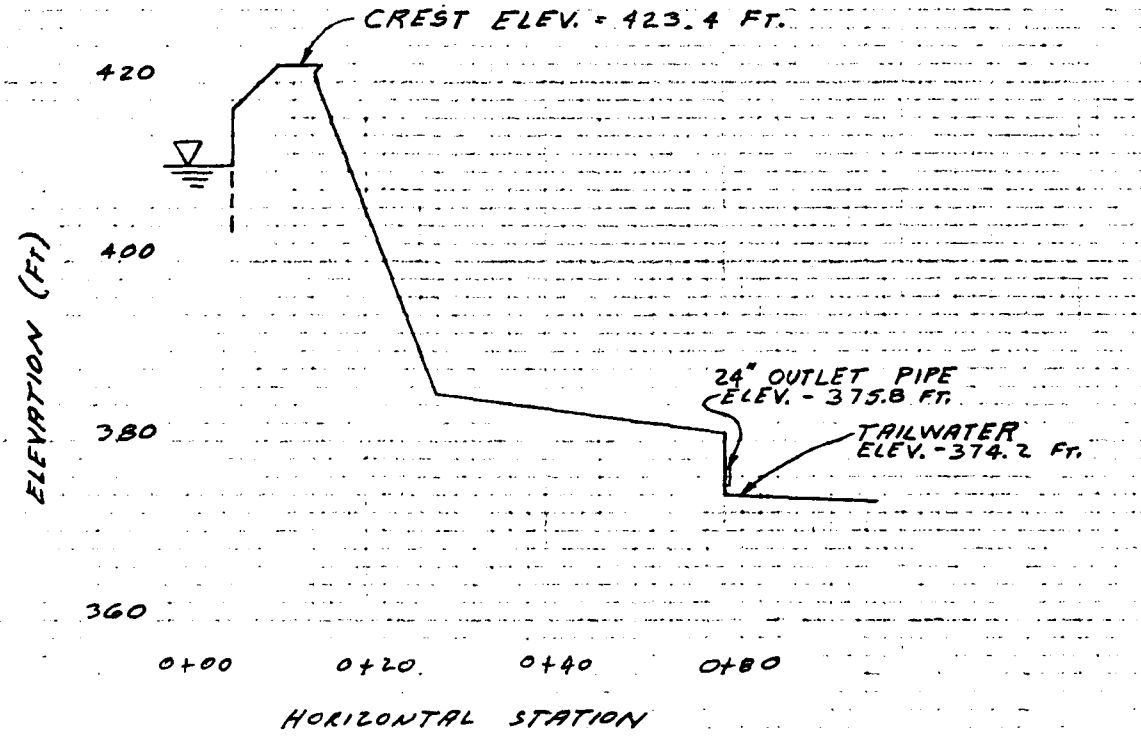
Subject MELZINGAH RESERVOIR DAM S.O. No. 13888-00-[illegible]
TOP OF DAM PROFILE AND Sheet No. 7 of 25
TYPICAL CROSS SECTION Drawing No. ____
Computed by GWT Checked by ____ Date 1-16-81

TOP OF DAM PROFILE (LOOKING DOWNSTREAM)

LENGTH OF DAM = 524 FT.



TYPICAL CROSS SECTION



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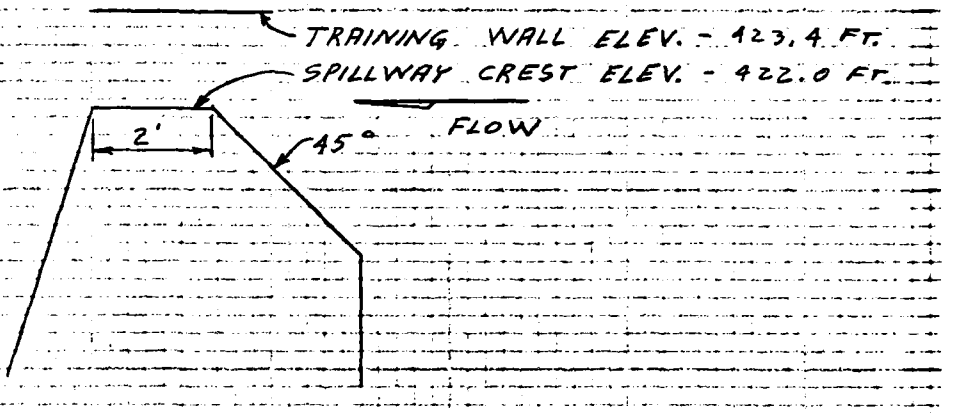
Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR DAM S.O. No.
SPILLWAY RATING Sheet No. 8 of 25
Drawing No.
Computed by GWT Checked by Date 1-16-81

SPILLWAY PROFILE



SPILLWAY IS A BROAD-CRESTED WEIR 2 FT. WIDE.

$Q = CLH^{3/2}$ HANDBOOK OF HYDRAULICS, BRATER & KING, Pg. 5-23.

C = 2.7 Pg. 5-43 BRATER + KING
L = TOTAL WEIR LENGTH = 100 FT.
H = MEASURED HEAD IN FEET

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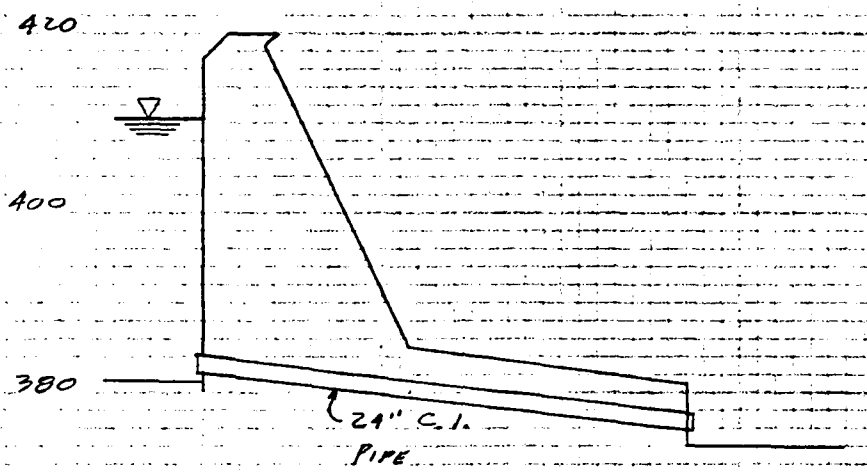
Subject MELZINGAH RESERVOIR DAM S.O. No.
OUTLET PIPE RATING Sheet No. 9 of 25
Drawing No.
Computed by GWT Checked by Date 1-26-81



SPILLWAY CREST ELEV. = 422.0 FT.
INLET 24" PIPE = 384.0 FT. (ESTIMATED)
OUTLET 24" PIPE = 375.8 FT.
LENGTH OF 24" OUTLET PIPE = 90 FT. (ESTIMATED)
OUTLET PIPE = 24" DIA. STEEL.

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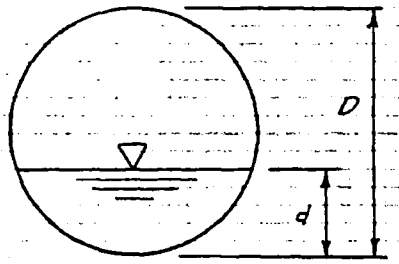
Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR DAM S.O. No.
24" DIA. PIPE RATING Sheet No. 10 of 25
Drawing No.
Computed by GWT Checked by Date 1-26-81
Method - JAQ

"DESIGN OF SMALL DAMS" PG. 558 AND 559



D = DIA. PIPE
d = DEPTH OF WATER
S = PIPE SLOPE
$= \frac{384.0 - 375.8}{90} = 0.0911$
n = .014

$\frac{d}{D} = \frac{.6}{2} = .3$ TABLE B-2 $.5225 = \frac{Q_c}{D^{5/2}} = \frac{Q_c}{2^{5/2}}$ $Q = 2.95$ CFS

$\frac{d}{D} = \frac{.6}{2} = .3$ TABLE B-3 $.0907 = \frac{Q_m}{D^{8/3} S^{1/2}} = \frac{Q(.014)}{2^{8/3}(.0911)^{1/2}}$ $Q = 12.42$ CFS

$\frac{d}{D} = \frac{1.2}{2} = .6$ TABLE B-2 $1.9773 = \frac{Q_c}{D^{5/2}} = \frac{Q_c}{2^{5/2}}$ $Q = 11.18$ CFS

$\frac{d}{D} = \frac{1.2}{2} = .6$ TABLE B-3 $.311 = \frac{Q_m}{D^{8/3} S^{1/2}} = \frac{Q(.014)}{2^{8/3}(.0911)^{1/2}}$ $Q = 42.57$ CFS

$\frac{d}{D} = \frac{1.75}{2} = .875$ TABLE B-2 $4.3388 = \frac{Q_c}{D^{5/2}} = \frac{Q_c}{2^{5/2}}$ $Q = 24.54$ CFS

$\frac{d}{D} = \frac{1.75}{2} = .875$ TABLE B-3 $.486 = \frac{Q_m}{D^{8/3} S^{1/2}} = \frac{Q(.014)}{2^{8/3}(.0911)^{1/2}}$ $Q = 66.53$ CFS

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Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR DAM S.O. No.
24" DIA. PIPE RATING Sheet No. 11 of 25
Drawing No.
Computed by GWT Checked by JAQ Date 1-26-81
method

PIPE FLOW

$$Q = \frac{A\,(2gH)^{1/2}}{[1 + K_e + K_b + K_c\,(L)]^{1/2}}$$

$$= \frac{3.14\,(2 \times 32.2 \times H)^{1/2}}{[1 + .78 + 0 + .0144(90)]^{1/2}}$$

$$= 14.367\,H^{1/2}$$

$A = \pi R^2 = \pi (1)^2 = 3.14$ FT^2

$g = 32.2$ FT/SEC^2

H = VARIES AND IS MEASURED FROM THE TOP OF PIPE AT THE OUTLET

$L = 90$ FT.

K_e (K_o) = .78 Pg. 5.5-6 SCS NEH-5

K_b (K_s) = 0 Pg. 5.5-10 SCS NEH-5

K_c (K_p) = .0144 PG. 5.5-4 SCS NEH-5

$n = 0.014$

TOP OF 24" PIPE AT OUTLET = ELEV. 375.8 FT.

ELEVATION, (FT)	H (FT)	Q (CFS)
386.0	10.2	45.88
387.0	11.2	48.08
388.0	12.2	50.18
390.0	14.2	54.14
392.0	16.2	57.83
394.0	18.2	61.29
396.0	20.2	64.57
398.0	22.2	67.69
400.0	24.2	70.68
402.0	26.2	73.54
404.0	28.2	76.29
406.0	30.2	78.95
408.0	32.2	81.53
410.0	34.2	84.02
412.0	36.2	86.44
414.0	38.2	88.80
416.0	40.2	91.09
418.0	42.2	93.33
420.0	44.2	95.52
422.0	46.2	97.65

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR DAM — S.O. No.
24" DIA PIPE RATING — Sheet No. 12 of 25
Drawing No.
Computed by GWT — Checked by ~~JE~~ Method JAQ — Date 1-26-81

ORIFICE FLOW

$Q = CA(2gH)^{.5}$

$= .60(3.14)(2 \times 32.2\ H)^{.5}$

$= 15.119\ H^{.5}$

$A = \pi R^2 = \pi(1)^2 = 3.14$ FT.^{2}

$g = 32.2$ FT/SEC^2

H: VARIES FROM 2.0 FT TO 38.0 FT. AND IS MEASURED TO THE CENTER OF THE PIPE

C = .60 FROM TABLE 4-5 Pg. 4-31 BRATER & KING

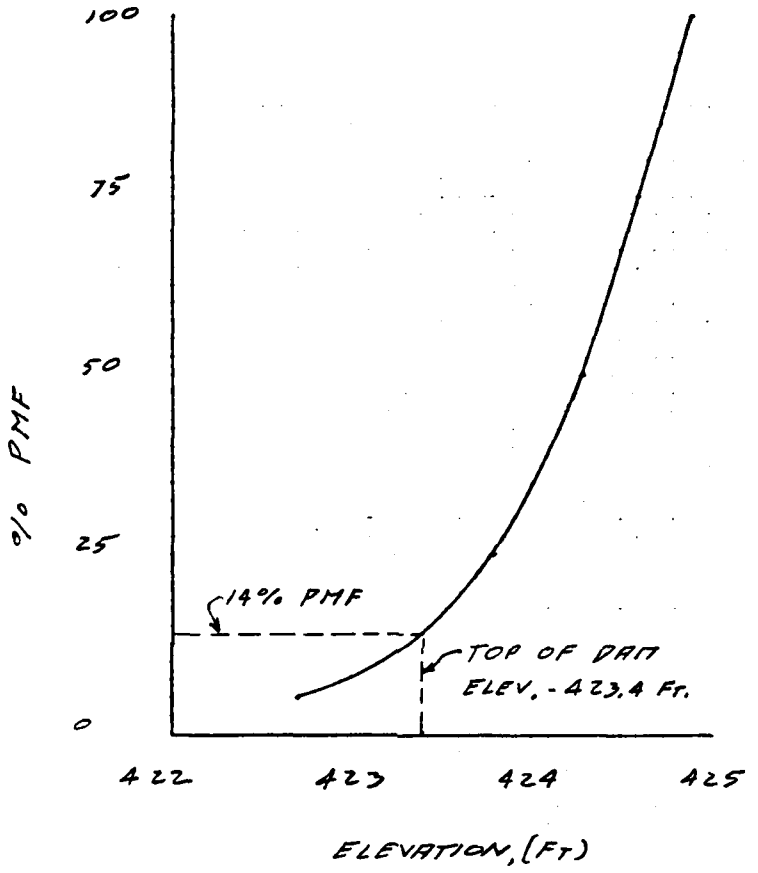
C.L. of inlet pipe @ elev. 385.0

ELEVATION, (FT)	H (FT)	Q (C.F.S.)
386.0	1.0	15.12
387.0	2.0	21.38
388.0	3.0	26.19
390.0	5.0	33.81
392.0	7.0	40.00
394.0	9.0	45.36
396.0	11.0	50.14
398.0	13.0	54.51
400.0	15.0	58.56
402.0	17.0	62.34
404.0	19.0	65.90
406.0	21.0	69.28
408.0	23.0	72.51
410.0	25.0	75.60
412.0	27.0	78.56
414.0	29.0	81.42
416.0	31.0	84.18
418.0	33.0	86.85
420.0	35.0	89.45
422.0	37.0	91.97

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR DAM S.O. No. _____
SPILLWAY CAPACITY ANALYSIS Sheet No. 13 of 25
_____ Drawing No. _____
Computed by GWT Checked by _____ Date 2-11-81



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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
  MBJ UPDATE         04 JUN 79    FLOOD ROUTING
**********
    1              A1       NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
    2              A2       HYDROLOGIC AND HYDRAULIC ANALYSIS OF MELZINGAH RESERVOIR DAM
    3              A3       UNIT HYDROGRAPH BY SNYDERS METHOD
    4              B     300         3        10         0         3         0         0         0        -4         0
    5              B1      2
    6              J       1         5         1
    7              J1    1.0      0.75       0.5      0.25      0.05
    8              K       3         1                                                  1
    9              K1       RUNOFF HYDROGRAPH TO DAM
   10              M       1         1      1.42
   11              P                41.3       111       123       133       142
   12              T                                                                 1.0       0.1
   13              W     2.37       .53
   14              X     -1.5     -0.25       2.0
   15              K       1         2                                                  1
   16              K1       ROUTING FOR MELZINGAH RESERVOIR DAM
   17              Y                                                   1         1
   18              Y1      1                                                  -422.0         0
   19              $A    3.13      6.43     11.63
   20              $E  384.0     422.0     440.0
   21              $$  422.0     400.0       2.7       1.5
   22              $D  423.0       2.6       1.5       424
   23              $L      0       110       424       434
   24              $V  423.0     423.5       424     424.5
   25              K      99
```

SHEET 14 OF 25

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
MOD UPDATE 04 JUN 79
****

RUN DATE 12/11/81
TIME 11.13

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
HYDROLOGIC AND HYDRAULIC ANALYSIS OF MELZINGAH RESERVOIR DAM
UNIT HYDROGRAPH BY SNYDERS METHOD

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1
RTIOS= 1.00 0.75 0.50 0.25 0.05

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

RUNOFF HYDROGRAPH TO DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.42	0.0	1.42	0.0	0.0	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	21.30	111.00	123.00	133.00	142.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.300

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.00	0.0	0.0

UNIT HYDROGRAPH DATA
TP= 2.37 CP=0.63 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH 78 END-OF-PERIOD ORDINATES, LAG= 2.38 HOURS, CP= 0.63 VOL= 1.00

5.	17.	36.	57.	80.	100.	132.	159.	185.	201.
224.	233.	247.	251.	250.	241.	226.	209.	194.	179.
166.	154.	143.	132.	122.	113.	105.	97.	90.	83.
77.	72.	66.	61.	57.	53.	49.	45.	42.	39.

SHEET 15 OF 25

17.	15.	14.	13.	12.	11.	11.	10.	9.	8.
8.	7.	7.	6.	6.	5.	5.	5.	4.	4.
4.	3.	3.	3.	3.	2.	2.	2.		

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	24.20	20.49	3.71	110420.
										(615.1(	520.1(	94.1(	3126.92)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTING FOR MELZINGAH RESERVOIR DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

IRCSS	LRCSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.0	0.0	1	1	0	0		0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	-422.	0

SURFACE AREA=	3.	6.	12.
CAPACITY=	0.	178.	338.
ELEVATION=	384.	422.	440.

CREL	SPNID	COQN	EXPN	ELEVL	COQL	CAREA	EXPL
422.0	100.0	2.7	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
423.4	2.6	1.5	424.

CREST LENGTH	0.	110.	424.	434.
AT OR BELOW ELEVATION	423.0	423.5	424.0	424.5

PEAK OUTFLOW IS 3113. AT TIME 42.00 HOURS

PEAK OUTFLOW IS 2335. AT TIME 42.00 HOURS

PEAK OUTFLOW IS 1556. AT TIME 42.00 HOURS

PEAK OUTFLOW IS 777. AT TIME 42.00 HOURS

PEAK OUTFLOW IS 154. AT TIME 42.17 HOURS

********** ********** ********** ********** **********

SHEET 16 OF 25

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5
				RATIOS APPLIED TO FLOWS				
				1.00	0.75	0.50	0.25	0.05
HYDROGRAPH AT	1	1.42	1	3112.	2334.	1556.	778.	156.
	(	3.68)	(	88.14)(	66.10)(	44.07)(	22.03)(	4.41)(
ROUTED TO	2	1.42	1	3113.	2335.	1556.	777.	154.
	(	3.68)	(	88.16)(	66.13)(	44.08)(	22.01)(	4.36)(

SHEET 14 OF 25

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	422.00	422.00	423.49
STORAGE	178.	178.	187.
OUTFLOW	0.	0.	447.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	424.89	1.49	198.	3114.	10.00	42.00	0.0
0.75	424.61	1.21	196.	2333.	8.83	42.00	0.0
0.50	424.28	0.88	193.	1550.	7.17	42.00	0.0
0.25	423.82	0.42	190.	777.	4.17	42.00	0.0
0.05	422.69	0.0	182.	154.	0.0	42.17	0.0

THE SDF IS THE PMF

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1973
  LAST MODIFICATION  26 FEB 79
  4BJ UPDATE         04 JUL 79    DEWATERING ANALYSIS
**********
    1              A1       NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
    2              A2       HYDROLOGIC AND HYDRAULIC ANALYSIS OF MELZINGAH RESERVOIR DAM
    3              A3       DEWATERING ANALYSIS OF MELZINGAH RESERVOIR DAM
    4              B    100       1       0       0       0       0       0       0       0       0
    5              B1     5
    6              J      1       1       1
    7              J1   1.0
    8              K      0       1                                       1
    9              K1       NULL RUNOFF HYDROGRAPH TO DAM
   10              M     -1               1.42            1.42                                    1
   11              N
   12              N
   13              N
   14              N
   15              N
   16              N
   17              N
   18              N
   19              N
   20              N
   21              K      1       2                                       1
   22              K1       DEWATERING MELZINGAH RESERVOIR DAM
   23              Y                                       1       1
   24              Y1     1                                                       -422.0      -1
   25              Y4 384.0   386.0   387.0   388.0   390.0   392.0   394.0   396.0   398.0   400.0
   26              Y4 404.0   408.0   412.0   416.0   420.0   422.0
   27              Y5     0    15.1    21.4    26.2    33.8    40.0    45.4    50.1    54.5    58.6
   28              Y5  65.2    72.2    78.6    84.2    89.5    92.0
   29              $A  3.13    6.43   11.63
   30              $E 384.0   422.0   440.0
   31              $$ 422.0
   32              $D 423.4     2.0     1.5   424.0
   33              K     99
```

Sheet 19 of 25

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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
  MBJ UPDATE         04 JUN 79
**********************************

RUN  DATE 02/10/81
     TIME    08.37

                     NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
                     HYDROLOGIC AND HYDRAULIC ANALYSIS OF MELZINGAH RESERVOIR DAM
                     DEWATERING ANALYSIS OF MELZINGAH RESERVOIR DAM

                                         JOB SPECIFICATION
              NQ      NHR     NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
             100        1        0       0       0       0       0       0       0       0
                                     JOPER     NWT   LROPT   TRACE
                                         5       0       0       0       0

                                 MULTI-PLAN ANALYSES TO BE PERFORMED
                                    NPLAN= 1 NRTIO= 1 LRTIO= 1
              RTIOS=    1.00

       **********          **********          **********          **********          **********

                                    SUB-AREA RUNOFF COMPUTATION

              NULL RUNOFF HYDROGRAPH TO DAM

                           ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE   IAUTO
                               1        0        0        0        0        0        1        0        0

                                          HYDROGRAPH DATA
             IHYDG    IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
                -1       0     1.42      0.0     1.42      0.0      0.0        0        1        0

                                          INPUT HYDROGRAPH
         0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
         0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
         0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
         0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
         0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
         0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
         0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
         0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
         0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
         0.        0.        0.        0.        0.        0.        0.        0.        0.        0.

                               PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
                      CFS        0.        0.        0.        0.          0.
                      CMS        0.        0.        0.        0.          0.
                   INCHES                 0.0       0.0       0.0         0.0
                       MM                 0.0       0.0       0.0         0.0
                    AC-FT                  0.        0.        0.          0.
             THOUS CU M                    0.        0.        0.          0.
```

```
                         HYDROGRAPH AT STA     1 FOR PLAN 1, RTIO 1
     0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
     0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
     0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
     0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
     0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
     0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
     0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
     0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
     0.        0.        0.        0.        0.        0.        0.        0.        0.        0.
     0.        0.        0.        0.        0.        0.        0.        0.        0.        0.

                              PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
                     CFS        0.        0.        0.        0.            0.
                     CMS        0.        0.        0.        0.            0.
                  INCHES                0.0       0.0       0.0           0.0
                      MM                0.0       0.0       0.0           0.0
                   AC-FT                  0.        0.        0.            0.
               THOUS CU M                 0.        0.        0.            0.


         **********          **********          **********          **********          **********

                                     HYDROGRAPH ROUTING

                DEWATERING HELZINGAH RESERVOIR DAM

                         ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                             2       1       0       0       0       0       1       0       0
                                             ROUTING DATA
                 QLOSS   CLOSS     AVG    IRES   ISAME    IOPT    IPMP            LSTR
                   0.0     0.0     0.0       1       1       0       0               0

                         NSTPS   NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                             1       0       0     0.0     0.0     0.0   -422.      -1

       STAGE      384.00    386.00    387.00    388.00    390.00    392.00    394.00    396.00    398.00    400.00
                  404.00    408.00    412.00    416.00    420.00    422.00

        FLOW        0.0      15.10     21.40     26.20     33.80     40.00     45.40     50.10     54.50     58.60
                   65.90     72.50     78.60     84.20     89.50     92.00

 SURFACE AREA=        3.         6.       12.

     CAPACITY=        0.       178.      338.

    ELEVATION=      384.       422.      440.

                          CREL   SPWID    COQW    EXPW   ELEVL    COQL   CAREA    EXPL
                         422.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0

                                              DAM DATA
                                      TOPEL    COQD    EXPD   DAMWID
                                      423.4     2.6     1.5     424.

                                      STATION      2, PLAN 1, RATIO 1

                                    END-OF-PERIOD HYDROGRAPH ORDINATES
                         MO.DA  HR.MN  PERIOD  HOURS    INFLOW  OUTFLOW  STORAGE    STAGE

                          1.01   1.00       1   1.00        0.      91.     170.    420.8
```

SHEET 21 of 25

1.01	2.00	2	2.00	0.	87.	183.	419.6
1.01	3.00	3	3.00	0.	87.	156.	418.4
1.01	4.00	4	4.00	0.	86.	149.	417.2
1.01	5.00	5	5.00	0.	84.	141.	416.1
1.01	6.00	6	6.00	0.	83.	135.	414.9
1.01	7.00	7	7.00	0.	81.	128.	413.7
1.01	8.00	8	8.00	0.	79.	121.	412.5
1.01	9.00	9	9.00	0.	78.	115.	411.3
1.01	10.00	10	10.00	0.	76.	108.	410.1
1.01	11.00	11	11.00	0.	74.	102.	408.9
1.01	12.00	12	12.00	0.	72.	96.	407.7
1.01	13.00	13	13.00	0.	70.	90.	406.6
1.01	14.00	14	14.00	0.	68.	85.	405.4
1.01	15.00	15	15.00	0.	66.	79.	404.2
1.01	16.00	16	16.00	0.	64.	74.	403.1
1.01	17.00	17	17.00	0.	62.	68.	401.9
1.01	18.00	18	18.00	0.	60.	63.	400.8
1.01	19.00	19	19.00	0.	58.	58.	399.7
1.01	20.00	20	20.00	0.	56.	54.	398.6
1.01	21.00	21	21.00	0.	53.	49.	397.5
1.01	22.00	22	22.00	0.	51.	45.	396.5
1.01	23.00	23	23.00	0.	49.	41.	395.5
1.02	0.0	24	24.00	0.	47.	37.	394.5
1.02	1.00	25	25.00	0.	44.	33.	393.5
1.02	2.00	26	26.00	0.	42.	30.	392.6
1.02	3.00	27	27.00	0.	39.	26.	391.7
1.02	4.00	28	28.00	0.	36.	23.	390.8
1.02	5.00	29	29.00	0.	34.	20.	390.0
1.02	6.00	30	30.00	0.	31.	18.	389.3
1.02	7.00	31	31.00	0.	28.	15.	388.6
1.02	8.00	32	32.00	0.	26.	13.	387.9
1.02	9.00	33	33.00	0.	23.	11.	387.3
1.02	10.00	34	34.00	0.	20.	9.	386.8
1.02	11.00	35	35.00	0.	17.	7.	386.3
1.02	12.00	36	36.00	0.	15.	6.	385.9
1.02	13.00	37	37.00	0.	12.	5.	385.6
1.02	14.00	38	38.00	0.	10.	4.	385.3
1.02	15.00	39	39.00	0.	8.	3.	385.1
1.02	16.00	40	40.00	0.	7.	3.	384.9
1.02	17.00	41	41.00	0.	6.	2.	384.7
1.02	18.00	42	42.00	0.	5.	2.	384.6
1.02	19.00	43	43.00	0.	4.	2.	384.5
1.02	20.00	44	44.00	0.	3.	1.	384.4
1.02	21.00	45	45.00	0.	2.	1.	384.3
1.02	22.00	46	46.00	0.	2.	1.	384.3
1.02	23.00	47	47.00	0.	2.	1.	384.2
1.03	0.0	48	48.00	0.	1.	1.	384.2
1.03	1.00	49	49.00	0.	1.	0.	384.1
1.03	2.00	50	50.00	0.	1.	0.	384.1
1.03	3.00	51	51.00	0.	1.	0.	384.1
1.03	4.00	52	52.00	0.	1.	0.	384.1
1.03	5.00	53	53.00	0.	1.	0.	384.1
1.03	6.00	54	54.00	0.	0.	0.	384.1
1.03	7.00	55	55.00	0.	0.	0.	384.0
1.03	8.00	56	56.00	0.	0.	0.	384.0
1.03	9.00	57	57.00	0.	0.	0.	384.0
1.03	10.00	58	58.00	0.	0.	0.	384.0
1.03	11.00	59	59.00	0.	0.	0.	384.0
1.03	12.00	60	60.00	0.	0.	0.	384.0
1.03	13.00	61	61.00	0.	0.	0.	384.0
1.03	14.00	62	62.00	0.	0.	0.	384.0
1.03	15.00	63	63.00	0.	0.	0.	384.0
1.03	16.00	64	64.00	0.	0.	0.	384.0
1.03	17.00	65	65.00	0.	0.	0.	384.0
1.03	18.00	66	66.00	0.	0.	0.	384.0
1.03	19.00	67	67.00	0.	0.	0.	384.0

1.03	20.00	68	68.00	0.	0.	0.	384.0
1.03	21.00	69	69.00	0.	0.	0.	384.0
1.03	22.00	70	70.00	0.	0.	0.	384.0
1.03	23.00	71	71.00	0.	0.	0.	384.0
1.04	0.0	72	72.00	0.	0.	0.	384.0
1.04	1.00	73	73.00	0.	0.	0.	384.0
1.04	2.00	74	74.00	0.	0.	0.	384.0
1.04	3.00	75	75.00	0.	0.	0.	384.0
1.04	4.00	76	76.00	0.	0.	0.	384.0
1.04	5.00	77	77.00	0.	0.	0.	384.0
1.04	6.00	78	78.00	0.	0.	0.	384.0
1.04	7.00	79	79.00	0.	0.	0.	384.0
1.04	8.00	80	80.00	0.	0.	0.	384.0
1.04	9.00	81	81.00	0.	0.	0.	384.0
1.04	10.00	82	82.00	0.	0.	0.	384.0
1.04	11.00	83	83.00	0.	0.	0.	384.0
1.04	12.00	84	84.00	0.	0.	0.	384.0
1.04	13.00	85	85.00	0.	0.	0.	384.0
1.04	14.00	86	86.00	0.	0.	0.	384.0
1.04	15.00	87	87.00	0.	0.	0.	384.0
1.04	16.00	88	88.00	0.	0.	0.	384.0
1.04	17.00	89	89.00	0.	0.	0.	384.0
1.04	18.00	90	90.00	0.	0.	0.	384.0
1.04	19.00	91	91.00	0.	0.	0.	384.0
1.04	20.00	92	92.00	0.	0.	0.	384.0
1.04	21.00	93	93.00	0.	0.	0.	384.0
1.04	22.00	94	94.00	0.	0.	0.	384.0
1.04	23.00	95	95.00	0.	0.	0.	384.0
1.05	0.0	96	96.00	0.	0.	0.	384.0
1.05	1.00	97	97.00	0.	0.	0.	384.0
1.05	2.00	98	98.00	0.	0.	0.	384.0
1.05	3.00	99	99.00	0.	0.	0.	384.0
1.05	4.00	100	100.00	0.	0.	0.	384.0

PEAK OUTFLOW IS 92. AT TIME 0.0 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	91.	86.	69.	29.	2061.
CMS	3.	2.	2.	1.	58.
INCHES		0.56	1.81	2.25	2.25
MM		14.28	46.05	57.16	57.16
AC-FT		43.	137.	170.	170.
THOUS CU M		52.	169.	210.	210.

********** ********** ********** ********** **********

SHEET 23 OF 25

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS
				RATIO 1
				1.00
HYDROGRAPH AT	1	1.42	1	0.
		(3.68)		(0.0)
ROUTED TO	2	1.42	1	91.
		(3.68)		(2.56)

SHEET 24 OF 25

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	422.00	422.00	423.40
STORAGE	178.	178.	187.
OUTFLOW	92.	92.	94.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	423.82	0.0	178.	92.	0.0	0.0	0.0

APPENDIX D

REFERENCES

REFERENCES

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5. Chow, Ven Te, Handbook of Applied Hydrology, McGraw - Hill Book Company, New York, 1964.

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18. U.S. Army, Office of the Chief of Engineers, Engineer Technical Letter No. ETL 1110-2-234, "Engineering and Design, National Program of Inspection of Non-Federal Dams, Review of Spillway Adequacy," Corps of Engineers, Washington, D.C., 10 May 1978.

19. U.S. Department of Commerce, "Technical Paper No. 40, Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years," Weather Bureau, Washington, D.C., May 1961.

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APPENDIX E

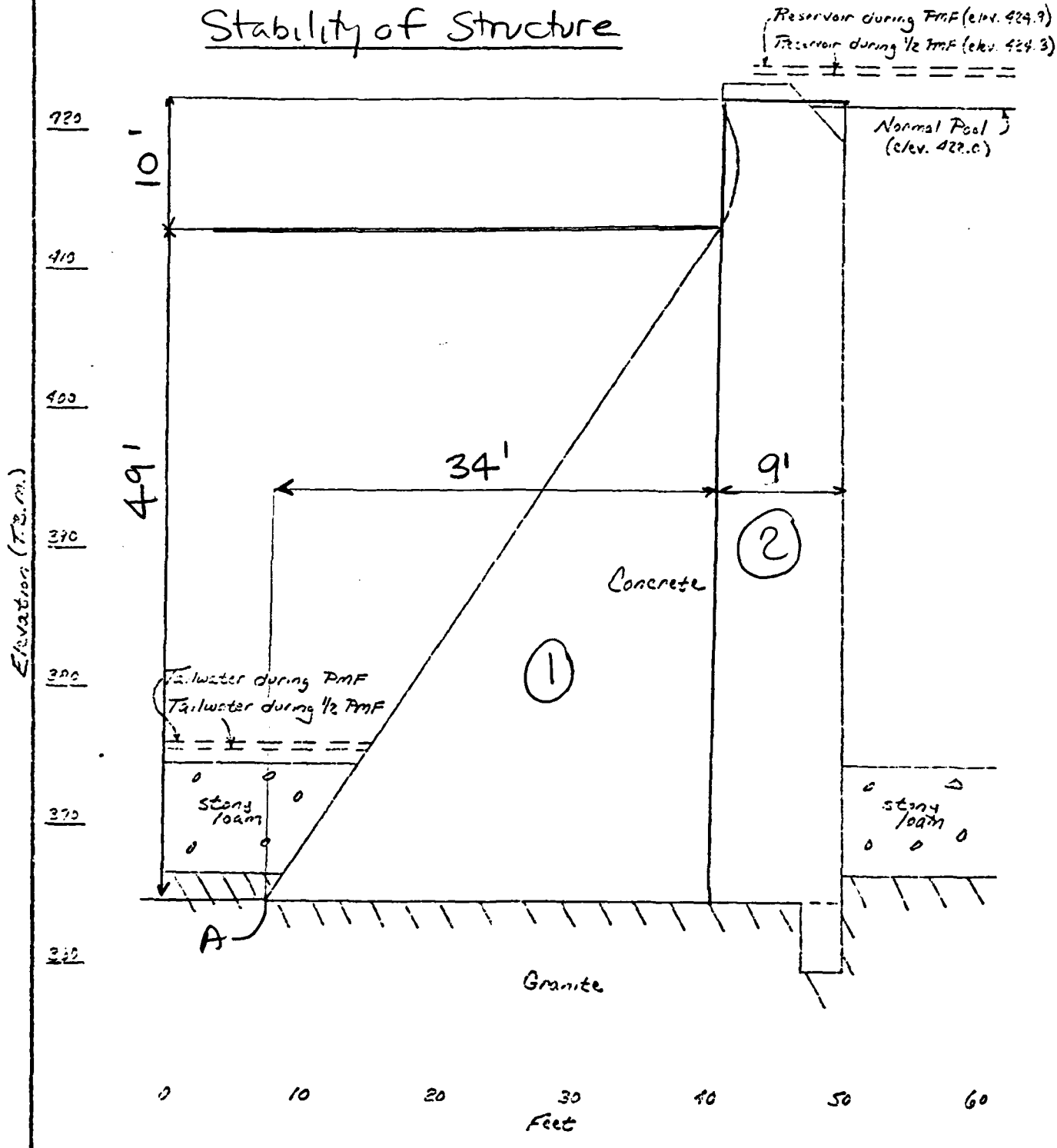
STRUCTURAL STABILITY

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject: MELLINGER RESERVOIR DAM S.O. No. 13988
STABILITY ANALYSIS Sheet No. 1 of 9
MAXIMUM DAM SECTION LEFT OF SPILLWAY Drawing No. MR1
Computed by ZWW/JT Checked by YAD Date Feb 1981

Stability of Structure



MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR DAM S.O. No. 13985
STABILITY ANALYSIS Sheet No. 2 of 9
Ref Drawing No. MR 2
Computed by JT Checked by JD Date Feb 1981

EMA Concrete Structure

		Area	W	Arm	M
①	½ × 34' × 49' @ .15K/ft³		125K	34' × 2/3	2883'K
②	9' × 59' @ .15K/ft³		80K	38.5'	3080'K
			205K		5913'K

$\bar{X} = 5913 \div 205 = 28.8'$

Middle Third = 14.33' to 28.67' from Toe

Soil Pressure

$e = 22.0 - \frac{43}{2} = 0.5' \leq \frac{43}{6} = 7$

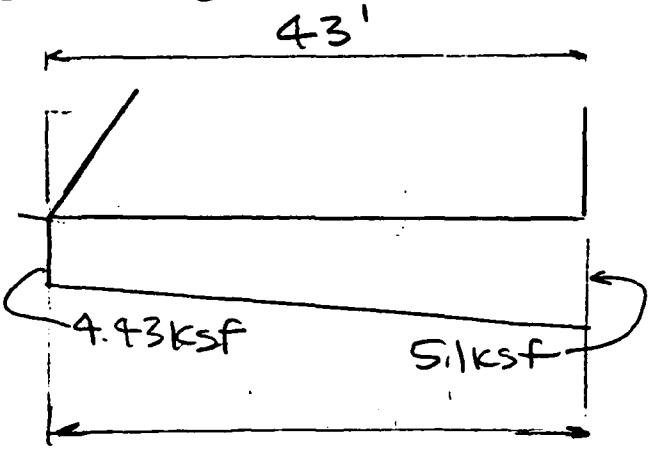
$P = 205^K$

$P_1 = P\left(1 \pm \frac{6e}{b}\right)$

$P_1 = \frac{205}{43}\left(1 \pm \frac{6 \times 0.5}{43}\right)$

$p_{max} = 5.1$ ksf

$p_{min} = 4.43$ ksf



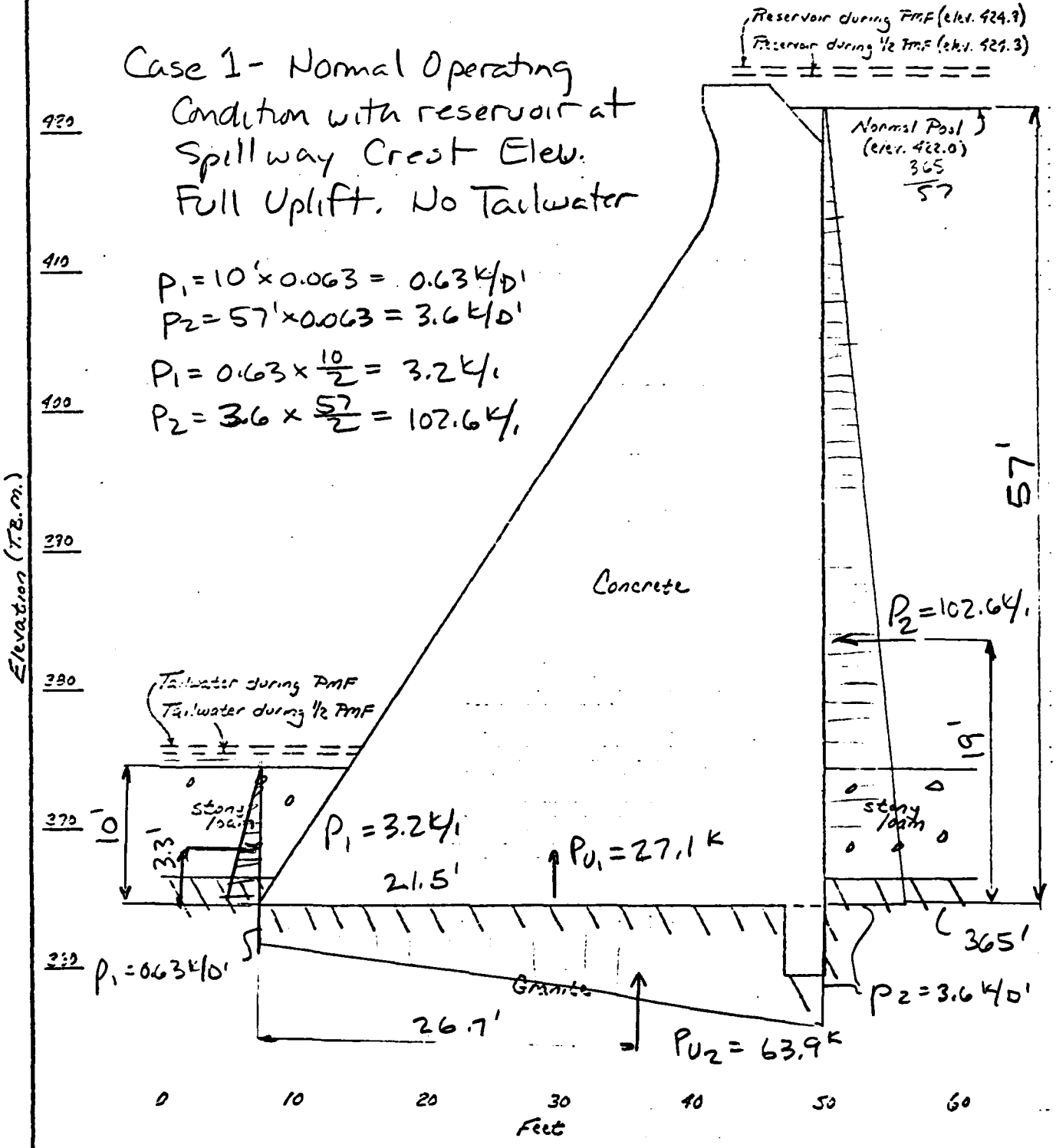
MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MERRIMAN RESERVOIR DAM S.O. No. 13985
STABILITY ANALYSIS Sheet No. 3 of 9
MAXIMUM SECTION LEFT OF SPILLWAY Ref. No. MR3
Computed by ZWP/JI Checked by JAD Date Feb 1981

Case 1 - Normal Operating Condition with reservoir at Spillway Crest Elev. Full Uplift. No Tailwater

$P_1 = 10' \times 0.063 = 0.63 K/D'$
$P_2 = 57' \times 0.063 = 3.6 K/D'$
$P_1 = 0.63 \times \frac{10}{2} = 3.2 K/$
$P_2 = 3.6 \times \frac{57}{2} = 102.6 K/$



MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR DAM S.O. No. 13566
STABILITY ANALYSIS Sheet No. 4 of 9
Ref Drawing No. MR4
Computed by JT Checked by JAD Date Feb 1981

Case 1

ΣM_A	W		arm	M
Structure	205 ↓			5913 'k
Uplift P_{U_1} =	27.1 ↑		-21.5'	-583 'k
P_{U_2} =	63.9 ↑		-28.7'	+834 'k
				+5924
				-4367
Water Pressure				
P_1 =	3.2k →		3.3'	11 'k
P_2 =	102.6k ←		19'	-1950 'k
ΣV =	114.0 ↓			+1557
ΣH =	99.4k ←			

$\bar{X} = 1557 \div 114.0$ 'k = 13.7'

FS against OT = $\frac{5924}{4367} = 1.36$

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR DAM S.O. No. 13985
STABICITY ANALYSIS Sheet No. 5 of 9
Ref Drawing No. MR5
Computed by JT Checked by JD Date Feb 1981

Case 2 To Case 1 add 5K Ice Load at Reservoir Level

	ΣM_A	W	arm	M
Case I		↑ 114.0 K ← 99.4K		1557
Ice Load	←	5K	57'	-285
				1272

$\Sigma V = 114.0$ K

$\Sigma H = 104.4$ K

$X = 1272 \div 114$ K $= 11.16'$

FS against OT $= \frac{5924}{4367 + 285} = 1.27$

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MELZINGAH DAM — STABILITY ANALYSIS — S.O. No. 13933
Sheet No. 6 of 9
Ref. Drawing No. MR 6
Computed by JAD — Checked by _____ — Date FEB 1981

CASE 3: — RESERVOIR LEVEL DURING ½ PMF, (EL. 429.3)
FULL UPLIFT
TAILWATER AT EL 375.5 (1.0')

$P_1 = 11 \times 0.063 = 0.69$ K/0'

$P_2 = 59.3 \times 0.063 = 3.74$ K/0'

$P_1 = 0.69 \times \frac{11}{2} = 3.80$ K/'

$P_2 = 3.74 \times \frac{59.3}{2} = 110.9$ K/'

$P_u = (0.69 \times 43) + (3.74 - 0.69)\frac{43}{2}$

$= 29.7 + 65.6$

ΣMA.		W	arm	M
STRUCTURE		205 ↓		+ 5913 'K
UPLIFT	P_{U_1}	29.7 ↑	− 21.5	− 639
	P_{U_2}	65.6 ↑	− 28.7	− 1883
				+ 5927
WATER PRESSURE				− 4718
	P_1	3.8 →	3.6'	+ 14
	P_2	110.9 ←	19.8'	− 2196
	ΣV = 109.7 ↓			+ 1209 'K
	ΣH = 107.1 ←			

$\bar{x} = 1209 \div 109.7 = 11.0'$

F.S. against OT = $\frac{5927}{4718} = 1.26$

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MELZINGAH DAM
STABILITY ANALYSIS

S.O. No. 13888
Sheet No. 7 of 9
Ref. Drawing No. MR 7
Computed by JAD Checked by _____ Date FEB 1981

CASE 4 — RESERVOIR LEVEL DURING PMF (EL 424.9)

FULL UPLIFT
TAILWATER AT EL. 376.0 (1.5')

$p_1 = 11.5 \times 0.063 = 0.72$ K/0'

$p_2 = 59.9 \times 0.063 = 3.77$ K/0'

$P_1 = 0.72 \times \frac{11.5}{2} = 4.14$ K/'

$P_2 = 3.77 \times \frac{59.9}{2} = 112.9$ K/'

$P_u = (0.72 \times 43) + (3.77 - 0.72)\,43/2$

$= 31.0 + 65.6$

ΣM_A	W	arm	M	
STRUCTURE	205 ↓		+5913	
UPLIFT P_{U_1}	31.0 ↑	−21.5	− 666	
P_{U_2}	65.6 ↑	− 28.7	− 1383	+5923
WATER PRESSURE				−4807
P_1	4.1 →	3.8'	+ 15	
P_2	112.9 ←	20.0'	− 2258	
	$\Sigma V = 108.4$ ↓		+ 1121	'K
	$\Sigma H = 108.8$ ←			

$\bar{X} = 1121 \div 108.4 = 10.3'$

F.S. against O.T. $= \frac{5923}{4807} = 1.23$

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR S.O. No. 13858
DAM STABILITY ANALYSIS Sheet No. 8 of 9
Ref Drawing No. MR 8
Computed by JT Checked by JAD Date Feb 1981

Sliding Resistance of Structure

$$R_R = V \tan(\phi + \alpha) + \frac{cA}{\cos\alpha(1 - \tan\phi \tan\alpha)}$$

See sheet D25 of "Recommended guidelines for safety inspection of Dams"

R_R = Sliding resistance Force on Critical Plane

Vertical Load = 6.6k

ϕ - the angle of internal friction of foundation material = 56°

c - the unit shearing strength at zero normal pressure along potential failure plane

A = Area of potential failure plane developing unit shear strength "c"

α = Angle between inclined plane and horizontal (positive for uphill sliding)

$\phi = 35°$ Shear Strength = 2 KSF

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MELZINGAH RESERVOIR DAM S.O. No. 13888-00-ARA

Sheet No. 9 of 9

Ref. Drawing No. MR 9

Computed by JAQ Checked by _____ Date May 1981

Case 1 Sliding Resistance $\alpha = 0°$

$$R_R = V \tan\Phi + cA$$
$$= 114.0^k \tan 35° + 2KSF \times 43'$$
$$= 80^k + 86^k = 166^k$$

Factor of Safety Against Sliding

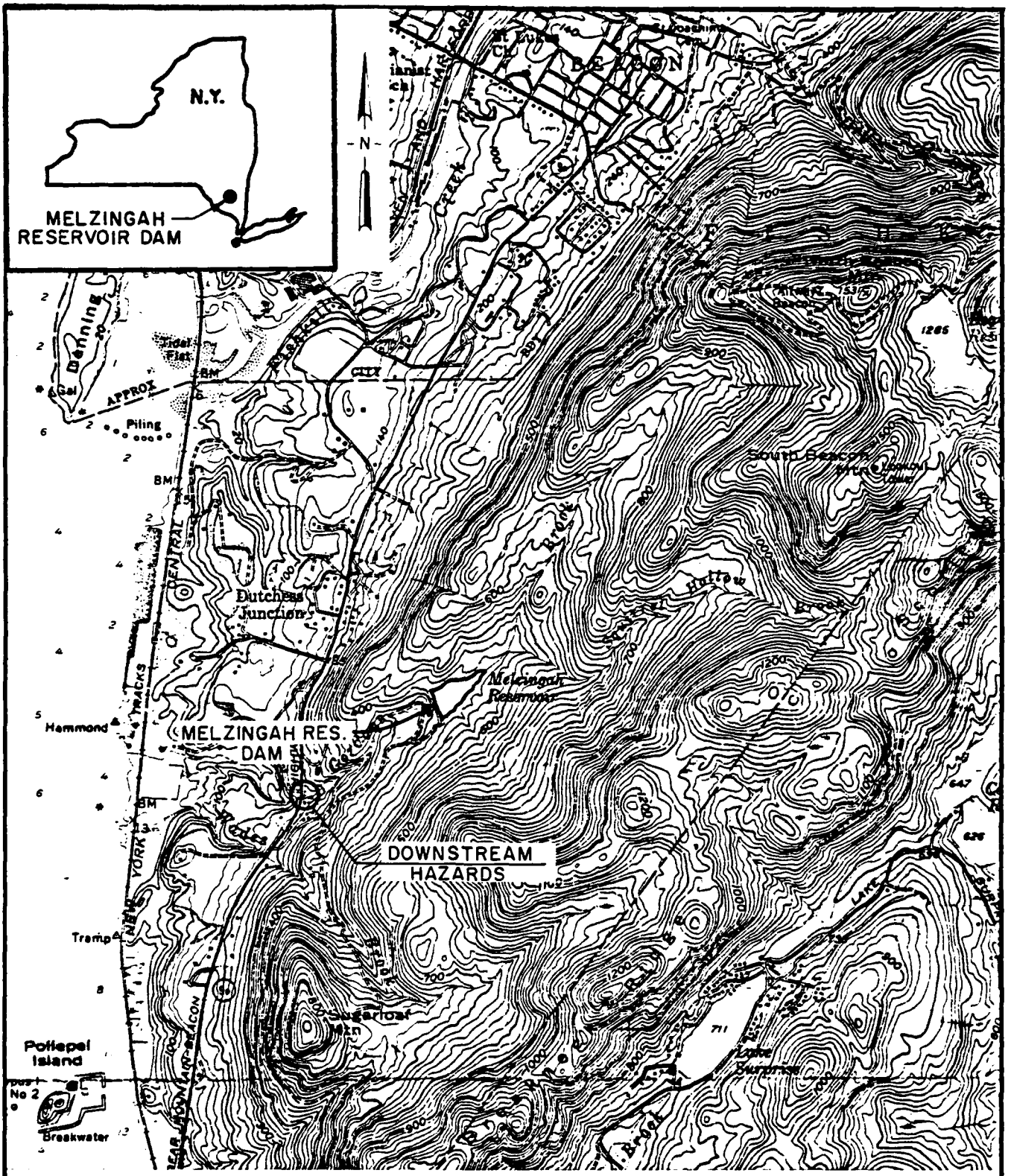
$$\frac{R_R}{\Sigma H} = \frac{166}{99.4} = 1.67$$

Case	V	R_R	Σ	F.S.
2	114.0↓	166	104.4	1.59
3	109.7↓	163	107.1	1.52
4	108.4↓	162	108.8	1.49

APPENDIX F

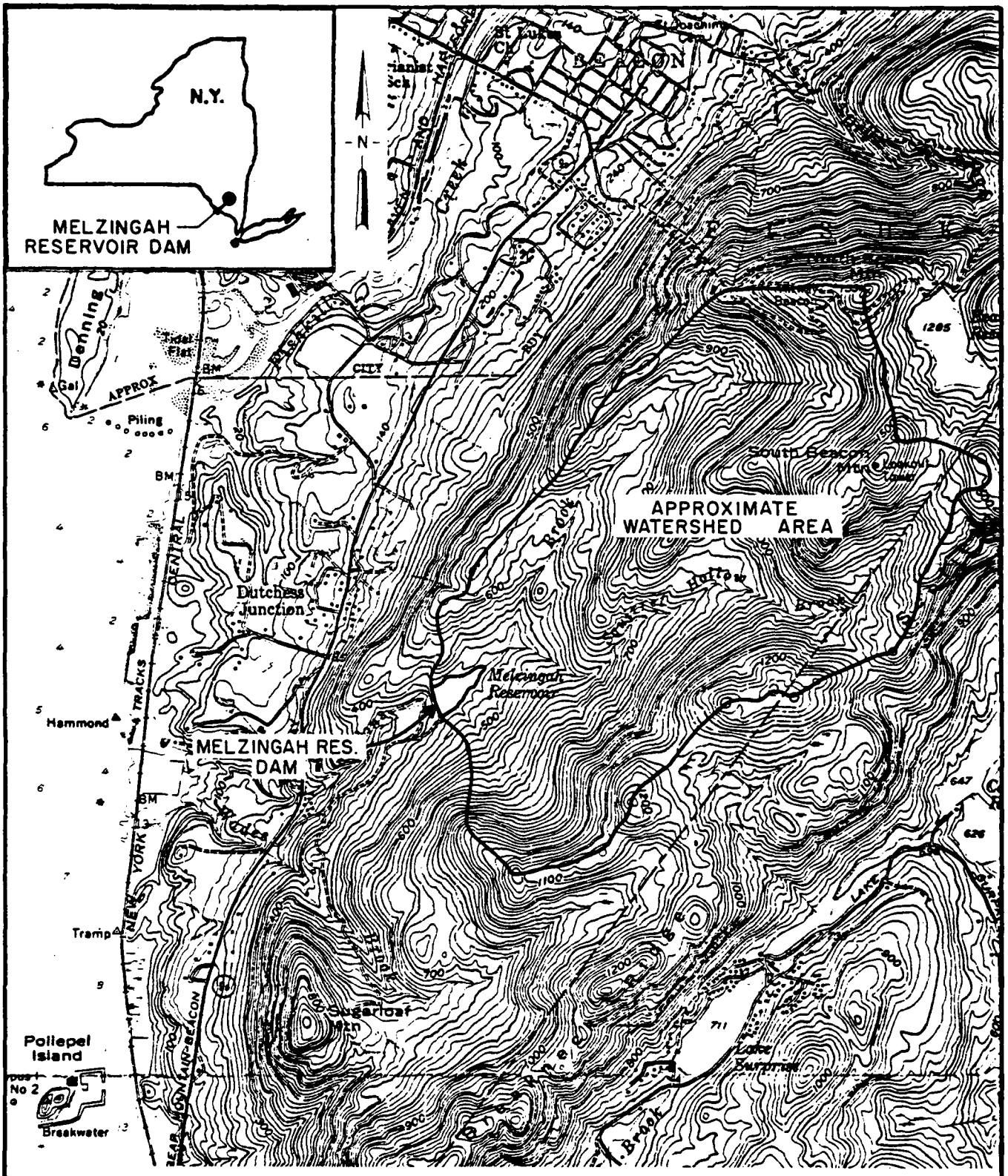
DRAWINGS

CONTENTS



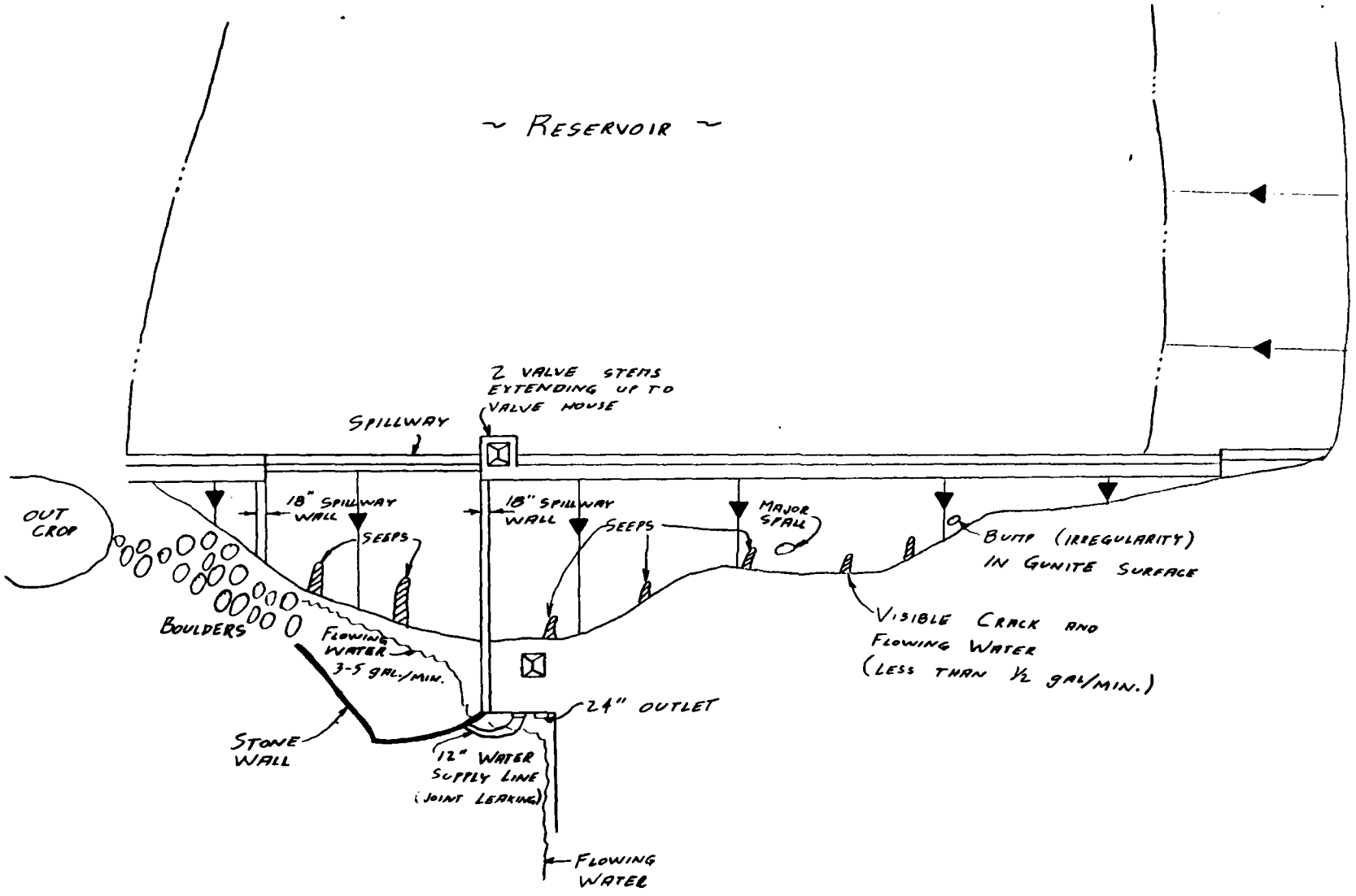
LOCATION PLAN
MELZINGAH RESERVOIR DAM

REFERENCES:
1. U.S.G.S. 7.5' WEST POINT, N.Y. QUADRANGLE, 1957



REFERENCES:
1. U.S.G.S. 7.5' WEST POINT, N.Y. QUADRANGLE. 1957

WATERSHED MAP
MELZINGAH RESERVOIR DAM

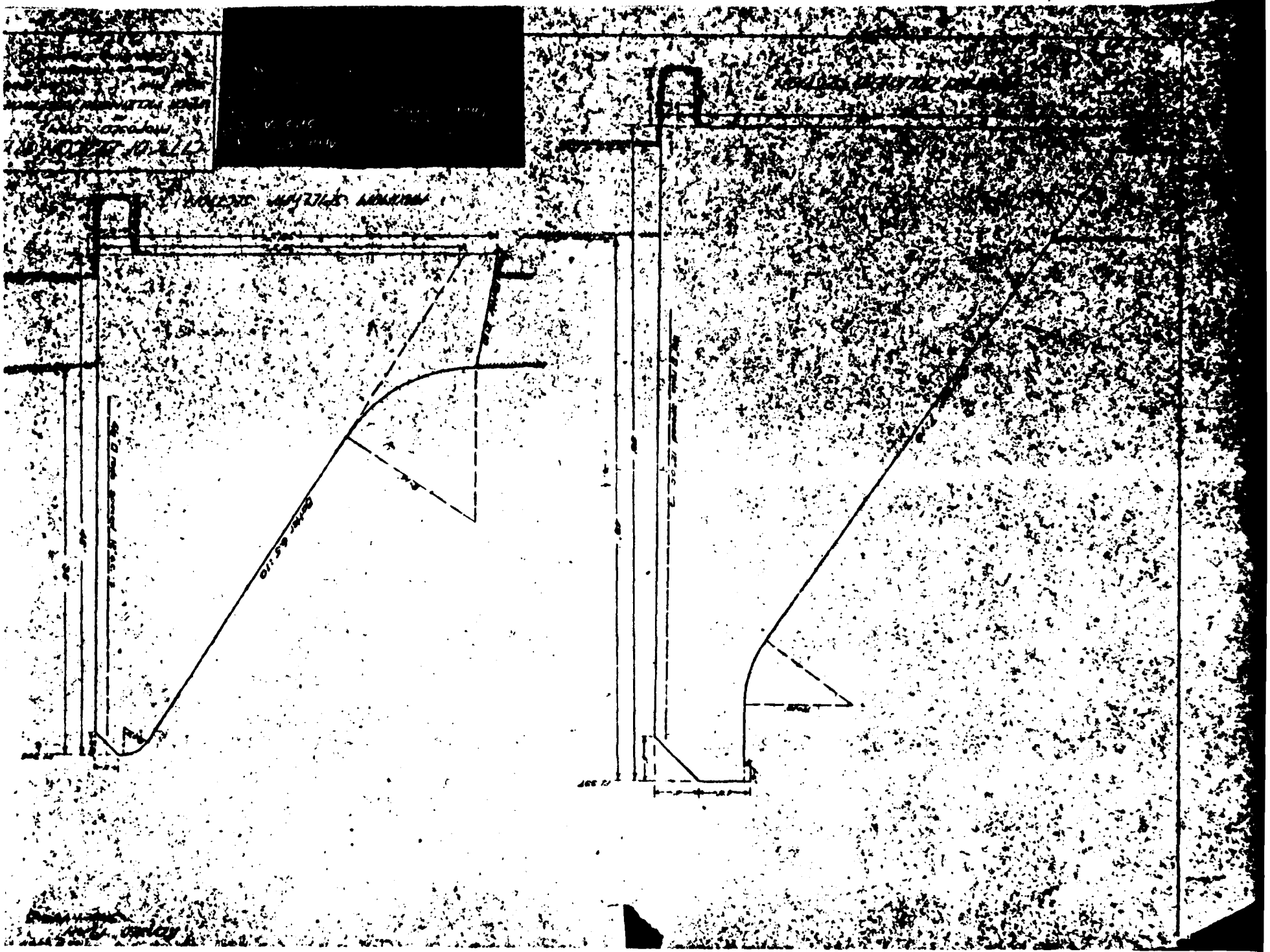


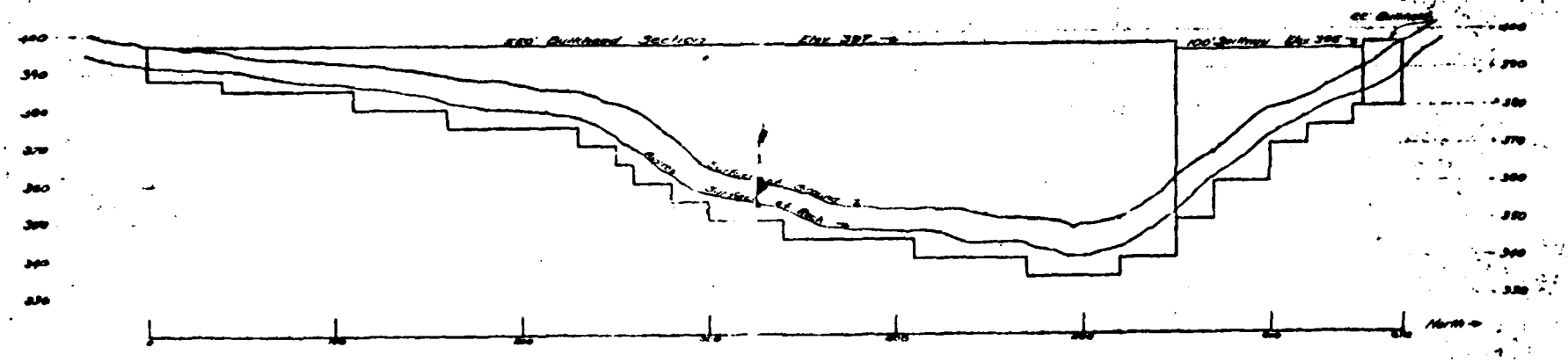
MELZINGAH RESERVOIR DAM

FIELD SKETCH

NOTE: ALL SEEPS ARE FROZEN UNLESS OTHERWISE NOTED

PLATE 1



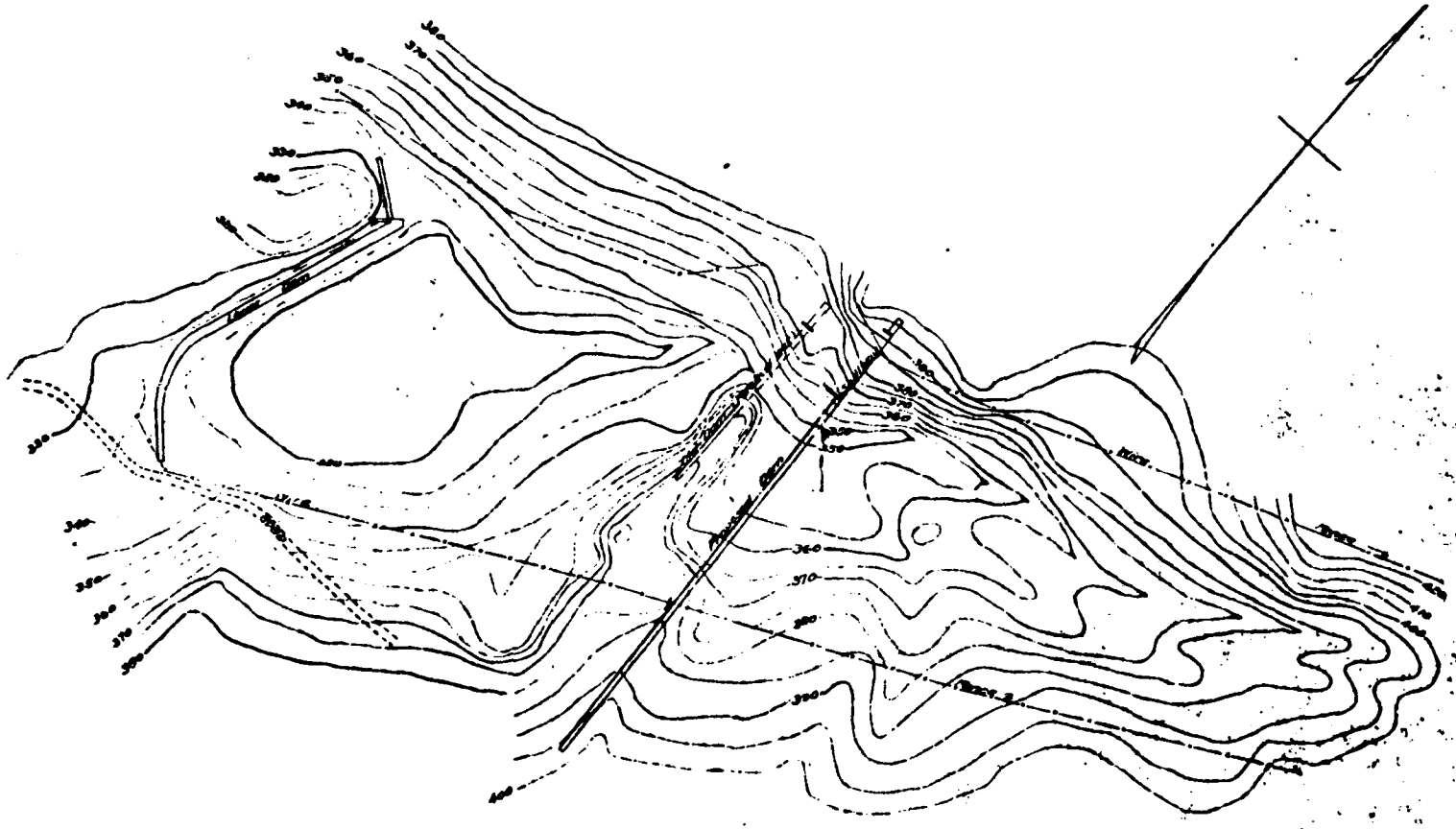


ELEVATION

Lower Hudson 523 A

CITY OF BEACON, N.Y.
PROPOSED DAM
ON
WAPPINGER MELZINGAH RESERVOIR
Jan 1923
George W. Krieger, Jr.
Consulting Engineer
PLATE 3

REVISED PLAN
Sheet No 1



Lower Hudson

April 5th
SR3 A

CITY OF BEACON, N.Y.
PROPOSED DAM
AT
UPPER MELZINGAH RESERVOIR
Scale 1"=100'
Consulting Engineer
PLATE A

APPENDIX G

BACKGROUND DOCUMENTS

8-18-22-1000 (6-2749)

STATE OF NEW YORK
DEPARTMENT OF
State Engineer and Surveyor
ALBANY

Received April 5th 1923 Dam No. 523 A L Hudson Watershed

Disposition Approved April 5th 1923 Serial No. 493

Site inspected

Foundation inspected

Structure inspected

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the State Engineer, Albany, N. Y., in compliance with the provisions of Chapter LXV of the Consolidated Laws and Chapter 647, Laws of 1911, Section 22 as amended, for the approval of specifications and detailed plans, marked City of Beacon, N.Y. Sheets 1-2-3

herewith submitted for the {construction / reconstruction} of a dam located as stated below. All provisions of law will be complied with in the erection of the proposed dam.

1. The dam will be on Melzingah branch of Hudson River in the town of Fishkill, County of Dutchess and 2 miles South of City of Beacon
(Give exact distance and direction from a well-known bridge, dam, village, main cross-roads or mouth of a stream)

2. The name and address of the owner is City of Beacon, N.Y.

3. The dam will be used for Water Supply

4. Will any part of the dam be built upon or its pond flood any State lands? No

5. The watershed at the proposed dam draining into the pond to be formed thereby is 1 1/5 square miles.

6. The proposed dam will have a pond area at the spillcrest elevation of 8 acres and will impound 7,000,000 cubic feet of water.

7. The lowest part of the natural shore of the pond is 100 feet vertically above the spillcrest, and everywhere else the shore will be at least 100 feet above the spillcrest.

8. The maximum known flow of the stream at the dam site was ——— cubic feet per second on ———
(Date)

9. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam No

10. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) Schist

11. The material of the right bank, in the direction with the current, is ledge; at the spillcrest elevation this material has a top slope of 5 inches vertical to a foot horizontal on the center line of the dam, a vertical thickness at this elevation of 20 feet, and the top surface extends for a vertical height of 100 feet above the spillcrest.

12. The material of the left bank is ledge; has a top slope of 5 inches to a foot horizontal, a thickness of 20 feet, and a height of 100 feet.

13. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. Hard impervious rock

14. If the bed is in layers, are the layers horizontal or inclined? If inclined what is the direction of the slope relative to the center line of the dam and the inches vertical to a foot horizontal?

15. What is the thickness of the layers?

16. Are there any porous seams or fissures?

17. WASTES. The spillway of the above proposed dam will be 100 feet long in the clear; the waters will be held at the right end by a bulkhead section the top of which will be 2 feet above the spillcrest, and have a top width of 8 feet; and at the left end by a bulkhead section the top of which will be 2 feet above the spillcrest, and have a top width of 8 feet.

18. There will be also for flood discharge a pipe 24 inches in diameter and the bottom will be 4.5 feet below the spillcrest, a sluice or gate feet wide in the clear by feet high, and the bottom will be feet below the spillcrest.

19. APRON. Below the proposed dam there will be an apron built of feet long, feet wide and feet thick. The downstream side of the apron will have a thickness of feet for a width of feet.

20. PLANS. Each application for a permit of a dam over 12 feet in height must be accompanied by a location map and complete working drawings of the proposed structure. Each drawing should have a title giving the parts shown, the name of the town and county in which the dam site is located, and the name of the owner and of the engineer.

The location map (U. S. Geological Quadrangle or other map) should show the exact location of the proposed dam; of buildings below the dam which might be damaged by any failure of the dam; of roads adjacent to or crossing the stream below the dam, giving the lowest elevation of the roadway above the stream bed and giving the shape, the height and the width of stream openings; and of any embankments or steep slopes that any flood could pass over. Also indicate the character and use made of the ground.

The above information is correct to the best of my knowledge and belief.

P.O Box 116 Poughkeepsie N.Y. George W. Kreegn Jr.
(Address of signer)

January 6, 1923 Consulting Engineer.
(Date) (A person signing for Applicant should indicate his title or authority).

ARMcK/F.

April 5, 1923.

Dam No. 523-A,
L. Hudson.

Hon. Marcus McLaughlin,
Commissioner of Public Works,
16 Spring Street,
Beacon, N. Y.

Dear Sir:

We have received from your engineer, Mr. George W. Krieger, Jr., three prints in duplicate, all dated January 1923, and marked "City of Beacon, N.Y. Proposed Dam on Upper Melzingah Reservoir, Sheets No. 1, No. 2 and No. 3", which dam is marked on our records as No. 523-A, Lower Hudson Watershed.

The above plans supersede the plans approved by the Conservation Commission January 29, 1914, and prepared by E. W. Clark, Civil Engineer, and also the plans dated December 1922, and approved by the State Engineer, December 26, 1922, prepared by your Consulting Engineer, George W. Krieger, Jr.

The plans are for a concrete dam with a spillway 100 ft. long x 2 ft. deep and 45 ft. high, the total length of the dam being 672 ft. Mr. Krieger states that the bed and banks are of a hard, impervious ledge so there can be no uplift under the dam and no danger if a cloud burst causes the spillway to be overtopped.

We will require that a report from your engineer be submitted for approval for each section of the bed and banks as soon as excavated, concerning the character of the material, the hardness and imperviousness, the roughness and shoulders to resist shear, the provisions against sliding and underseepage, and the proposed excavations in the bed and banks for the dam section and for the cutoff walls.

The construction of this dam is approved subject to the above requirements insofar as the matter involves the jurisdiction conferred upon this office by Chapter LXV of the Consolidated Laws and Chapter 647 of the Laws of 1911, Section 22, as amended.

and permission is given for the construction of this work up to November 1,1924. This approval shall not be deemed to authorize any invasion of property rights, either public or private, in carrying out the above work; nor to create any claim against the State of New York; nor to be considered as authorizing the flooding of State lands, nor as acquiescing in the flooding of such lands,nor to waive any requirement of Article IX of the Conservation Law relating to water supply.

We are sending you under separate cover one set of the above mentioned prints with our stamp of approval.

Please acknowledge the receipt of this letter and advise us when the work is started.

Very truly yours,

.....

Deputy State Engineer.

Copy to-
Mr. George W. Krieger, Jr.,
P. O. Box 116,
Poughkeepsie, N.Y.

MEMORANDUM FOR DEPUTY STATE ENGINEER A. G. CHAPMAN

On September 13th, in company with Mr. George W. Krieger, I inspected the site of the proposed reconstruction of dam No. 523-A, Lower Hudson, the Upper Melzingah Reservoir at Beacon.

At the north end the rock bed was allfairly well cleaned off and showed a good hard granite with sufficient shoulders for the shear from the section. This rock extends to a point 80 feet south of the spillway. South of this point there has been no rock found. The bed is a hard and impervious earth largely of red clay with some gravel and stones.

Respectfully submitted,

Inspector of Docks and Dams.

Sept. 14, 1923.

ARMcK/F.

AD-A105 766 BAKER (MICHAEL) JR INC BEAVER PA F/G 13/13
NATIONAL DAM SAFETY PROGRAM. MELZINGAH RESERVOIR DAM (INVENTORY--ETC(U)
JUN 81 G KESTER DACW51-81-C-0010
UNCLASSIFIED NL

C O P Y

July 17, 1924

Dam at Melzingah Reservoir
Beacon

Mr. E. D. Hendricks,
Division Engineer,
Albany, N. Y.

Dear Sir:-

I return, herewith, three blueprints and two sketches, on letter paper, of work being done under the above heading.

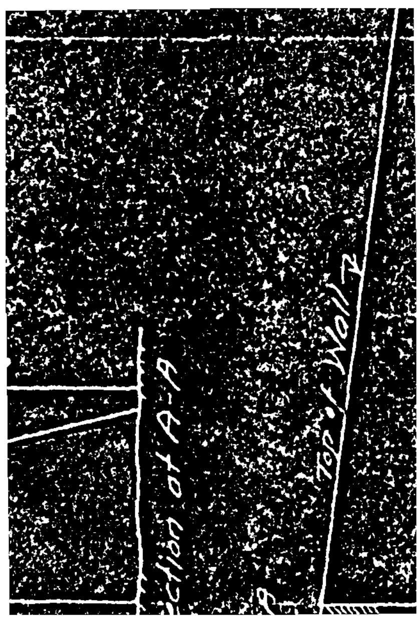
On the date of my inspection, July 16, 1924, the dam was practically completed, with the exception of about 40 ft. at the south end and 30 ft. at the north end. The concrete work appears to be very satisfactory. I examined several of the intersections between days' work and could find no traces of laitance. The vertical seams are well keyed and are coated with pitch. The horizontal seams are keyed by means of placing large boulders covering an area of between 30% and 40% of the horizontal surface. These boulders vary in size between 3/4 of a yard and a yard.

At the south end of the dam the rock profile shown on sheet #2 is not correct, as beginning at a point about 150 ft. from the end labeled Zero the rock dips very sharply to the south, and the footing of the dam at this point has been carried down through layers of sand and gravel into an underlying hardpan of blue clay and gravel, which it is impossible to dig with an ordinary shovel. The end section of the dam, as exposed, corresponds with the sections called for on the plans.

The Consulting Engineer has added to the south wing wall of the spillway a concrete retaining wall perpendicular to the base of the dam, which will have the effect of turning the water which comes over the spillway away from the point which is marked on sheet #1 of the plans as "old dam washed out." He proposes to fill in between this proposed seam and downstream face of the new dam and the old dam with earth. At the present time a large proportion of the space between the old dam and the new dam has already been so filled. I believe that this proposed wall will be a benefit to the work, as the underlying rock in front of the spillway slopes very sharply from the level at the end of the dam to this rock, and any water that comes over the spillway would naturally be deflected against it and would wash away a considerable portion of the fill used in this old earth dam.

I would recommend that the upstream face of this new dam at the south end be thoroughly backfilled to the level of the original surface above it.

The concrete is being made of sand and crushed stone which they have uncovered on the site of the work. The mixture is 1:2½:5. The concrete is placed in the forms by means of


ction at A-A
Top of Wall

Vertical
of Lower Section

Inspection,
Helzingah Dam,
Beacon,
Dutchess County

Dec. 4, 1928

Fred Rothery, Commissioner of Public Wks.,
City Hall,
Beacon, N. Y.

Dear Sir:-

As a result of a field inspection of Helzingah Dam, Beacon, Dutchess County, made on December 3rd by P. J. Keating, Superintendent Beacon Water Department, accompanied by you and C. D. Huhne, an employee of this Department, the following conclusions are submitted:-

1. The dam is safe, but to be kept in such condition requires regular maintenance and observation.

2. Recommended that flash boards at spillway be not installed.

3. Although we had no opportunity to observe the foundation material at the time this dam was constructed in 1924, lack of settlement of dam sections during the intervening four years and lack of foundation seepage indicates that the foundation has a uniformly high supporting power and is impervious. We understand the dam rests partly on rock, partly on hardpan.

4. Dam apparently is fairly well constructed, the minor defects noted, namely; scaling on down stream face and slight seepage along vertical joints is due to lack of proper maintenance since construction. The down stream face should be hammered and a new waterproof surface applied. The vertical joints on the upstream side should be lead caulked, plated, doweled and buttressed.

5. Recommend that the gravel terrain between the down stream face of the dam and the upper end of the lower pond be uniformly graded and heavily paved to prevent excessive scouring in the event of an unusual flow of water.

(cont.)

gah Dam.

6. We have only made general recommendations. Details and cost estimates may be obtained from private engineers or your city engineer either of whose functions it would be manifestly unfair for members of this Department to assume.

Very truly yours,

J. S. B I X B Y

District Engineer.

CAH:HS

CC. to Chief Engineer Acheson,
County Asst. C. O. Conger,
C. A. Huhne, Res. Engr.

STATE OF NEW YORK
DEPARTMENT OF PUBLIC WORKS

FRED'K STUART GREENE
SUPERINTENDENT

THOMAS F. FARRELL
CHIEF ENGINEER

DIVISION OF ENGINEERING

ALBANY, N. Y.,
April 25, 1930.

REC'D APR 26 1930
READY TO FILE

Mr. J. S. Bixby,
District Engineer,
Poughkeepsie, N. Y.

Dear Sir:

Mr. James P. Wells, C. E. of Rochester on a recent visit to this office critized the construction of the Upper Metzingah dam which forms a part of the Water Supply of the City of Beacon. He stated that there was not enough freeboard height above the spillway, and that the fill around the right hand end of the dam had not been brought to the full height of the concrete, leaving a chance for water to go around their end before the full discharge capacity of the spillway was reached.

Please investigate this matter and make report and recommendation. This dam was designated as L. H. 523-A. Inspection reports made during construction indicate that the concrete structure was built in accordance with the plans.

Very truly yours,
T. F. Farrell
T. F. FARRELL
Chief Engineer

CC:F

Beacon
523A

Dam Permit L.H. #523-A
Melzingah Dam,
Beacon, Dutchess County

May 1st, 1930.

T.F. Farrell, Chief Engr.,
Division of Engineering,
Albany, N.Y.

Dear Sir:

In reply to your letter dated April 25th regarding Melzingah Dam which has the characteristics noted herewith:

Location:	Quad 213, Sect. #1, Letter I, No. 12
Height of Dam:	Over 30 ft.
Drainage Area:	1.2 sq. mi.
Average Capacity:	Over 50,000,000 gals.
Owner:	City of Beacon, N.Y.
Date Completed:	1924.

please be advised that we have investigated this matter and beg to report as follows:-

Under date of December 4th, 1928 we advised Fred Rothery who at that time was the Beacon City Commissioner of Public Works, that flash boards which they intended to place on the 22" spillway be not installed. We are enclosing a copy of the aforementioned letter to Mr. Rothery.

No evidence was found to indicate that water had flowed around either end of the dam but both ends should have been extended further into banks; particularly the north end which was built to within 10 feet of a rock anchorage.

Dam concrete coarse aggregate was composed of gneiss and gravel, the latter probably introduced with the sand which very likely was dirty for the 1/2 cu. yd. of concrete talus lying at downstream foot of each vertical construction joint is due probably to dirty sand, freezing, copious plastering and non-uniformity of mix and manipulation.

All wooden form spreaders (4" diam) were left in place.

Only one bad leak about 10 feet from top of most southerly construction joint; discharges about 3 gallons per minute.

Dam Permit L.H. #523-A
Melzingah Dam,
Beacon, Dutchess County

T.F. Farrell, Chief Engr. -2- May 1st, 1930.

The valve on upper of two 24" blow off pipes leaks about 50 gallons per minute.

Dam has not settled.

Dam lacks maintenance and observation which will be increasingly necessary.

Mr. P.S. Keating, Supt. of Beacon Water Dept., advises that Mr. James P. Wells, C.E. of Rochester is at present making studies for additional water supply for Beacon.

Very truly yours,

J. S. B I X B Y

District Engineer

CAR/BHI

Copy to Mr. C. O. Conger
" " " C. A. Huhne

DAM DATA INSPECTION REPORT

RB	CTY	YR AP.	DAM NO.	INS. DATE	USE	TYPE
01	14	14	00523 A	042872	003	4

AS BUILT INSPECTION

1 Location of Sp'way and outlet	1 Elevations
1 Size of Sp'way and Outlet	1 Geometry of Non-overflow section

1 GENERAL CONDITION OF NON-OVERFLOW SECTION

1 Settlement	2 Cracks	1 Deflections
2 Joints	2 Surface of Concrete	2 Leakage
1 Undermining	1 Settlement of Embankment	1 Crest of Dam
1 Downstream Slope	1 Upstream Slope	1 Toe of Slope

1 GENERAL COND. OF SP'WAY AND OUTLET WORKS

1 Auxiliary Spillway	1 Service or Concrete Sp'way	1 Stilling Basin
2 Joints	2 Surface of Concrete	1 Spillway Toe
1 Mechanical Equipment	1 Plunge Pool	2 Drain

1 Maintenance	3 Hazard Class
3 Evaluation	3 Inspector

COMMENTS:

good condition

(By Visual Inspection)

Dam Number	River Basin	Town	County	Hazard Class	Date & Inspector
523 A	L. Hudson	Beacon	Dutchess	B	2/14/80 RMcH

Stream = Melzingah Owner = City of Beacon

Type of Construction

- ☐ Earth w/Concrete Spillway
- ☐ Earth w/Drop Inlet Pipe
- ☐ Earth w/Stone or Riprap Spillway
- ☑ Concrete
- ☐ Stone
- ☐ Timber
- ☐ Other _____

Use

- ☑ Water Supply
- ☐ Power
- ☐ Recreation - ☐ High Density
- ☐ Fish and Wildlife
- ☐ Farm Pond
- ☐ No Apparent Use-Abandoned
- ☐ Flood Control
- ☐ Other _____

Estimated Impoundment Size 180 ~~Acres~~ A-F Estimated Height of Dam above Streambed 50 Ft.

Condition of Spillway

- ☐ Service satisfactory
- ☑ In need of repair or maintenance
- ☐ Auxiliary satisfactory
- ☐ In need of repair or maintenance

Explain: Leakage.

Condition of Non-Overflow Section

- ☐ Satisfactory
- ☑ In need of repair or maintenance

Explain: Minor Leakage

Condition of Mechanical Equipment

- ☑ Satisfactory
- ☐ In need of repair or maintenance

Explain: _____

Siltation ☐ High ☑ Low

Explain: _____

Remarks: Gunite must be removed to eradicate leakage.

Evaluation (From Visual Inspection)

- ☐ Repairs req'd. beyond normal maint.
- ☐ No defects observed beyond normal maint.

Robert F. Flacke

February27, 1980

Commissioner of Public Works
City of Beacon
Vernon Way
Beacon, New York

Re: Dam #523A and 523
Upper and Lower Melzingah
Lower Hudson

Dear Sir:

In accordance with the Department's Dam Safety Program, an inspection of the referred to dams was conducted on February 14, 1980.

The upper Melzingah Reservoir Dam was found to be leaking in the spillway section. The gunite surface is deteriorating and also hindered efforts to uncover the sources of the leakage.

This office recommends that the leakage be monitored by means of weirs and the source of the leaks be found by means of removing the gunite in critical areas. The services of a professional engineer are acquired to ascertain the seepage conditions and their affect upon the structural stability of the spillway section.

The impoundment should be kept as low as possible until the structure has been declared stable by the engineer.

The Lower Melzingah Dam was found to be leaking at several locations. Trees and brush were observed growing on the embankment and in the some spillway.

Either the impoundment should be lowered or the structure should be repaired. Repairs would include tree removal and engaging the services of a professional engineer so that remedial work can be instituted to control the leakage.

Please inform this office by March 31, 1980 as to your intentions regarding the above.

Sincerely,

Kenneth D. Harmer
Dam Safety Coordinator

cc: M. Giordano, G. Danskin, P. Keller